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Rock Products

and

CEMENT and ENGINEERING NEWS (Est. 1896)

THE OLDEST PUBLICATION IN ITS FIELD AND THE RECOGNIZED AUTHORITY

AMERICAN CRUSHERS

Why Plant Owners Are Buying Them

The 1935 models of American Pulverizers are characterized by—1. Compact designs. 2. Heavy cast construction. 3. Cast steel adjustable plattens. 4. Cast steel discs—two inches thick! 5. Heavy alloy steel shafts. 6. SKF spherical roller bearings. 7. Manganese-lined crushing chamber. 8. Easy installation. 9. All parts very accessible. 10. Low first cost!

Many producers are finding it advantageous to study their reduction set-ups. In many cases they are finding it possible to effect large savings by installing the very-modern crushers which we currently are offering. They're really ahead of their times.

The new American Crushers are illustrated and described fully in our new folder. Send for it. You will be favorably impressed.

Investigate NOW!

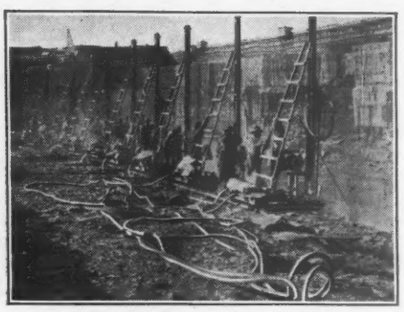
AMERICAN PULVERIZER COMPANY

1245 MACKLIND AVENUE ST. LOUIS, MISSOURI

Condor AIR HOSE

USED ON T. V. A. PROJECT

Scenes . . .



from the T. V. A.

Project, Tennessee.

Condor Air Hose is designed for heavy rough service such as is encountered in the T. V. A. Project now under way. This hose earned its reputation for dependability and long life in quarries, mines, construction work and drilling operations of every type throughout the United States. It will withstand external abuse, irregular pressures, oil in the air line, sun exposure and all natural hardships of drilling. . .

Condor Air Hose is manufactured exclusively of the strongest grade of heavy cotton duck, wrapped about a thick, tough, oil-resistant tube, and impregnated through and through with a tough wear-resisting, slow-aging rubber compound. Also furnished molded type in long lengths. Condor Air Hose is designed for maximum hose economy. A trial will convince you.

Sold by leading jobbers

Condor PRODUCTS

Transmission Belt	Fire Hose
V-Belt	Hydraulic Hose
Conveyor Belt	Steam Hose
Air Hose	Water Hose
Contractors Hose	Chute Lining
Sand Blast Hose	Launder Lining
Suction Hose	Industrial Brake Blocks

Molded Goods

THE MANHATTAN RUBBER MFG. DIVISION
OF RAYBESTOS-MANHATTAN, INC.

LINK-BELT NEWS

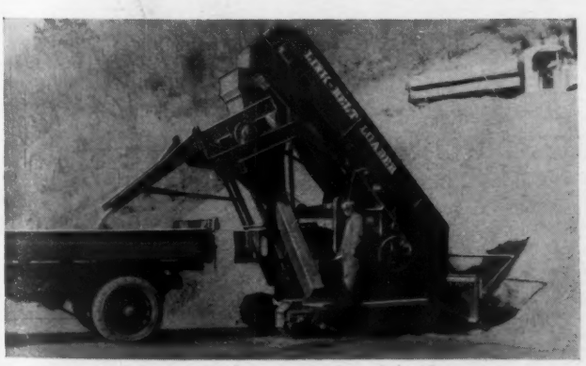
Devoted to Better Methods of Handling and Preparing Materials

SCREENING GRAVEL FOR FORT PECK DAM

Becker County—Shiely Co. have in service two Link-Belt portable gravel screening and loading plants for supplying gravel for the toe of this earth-filled dam now being built at Fort Peck, Montana. These unique plants each have a capacity of 550 tons per hour of pit-run material. The sand is screened out and returned to the pit, the boulders being loaded into trucks for disposal.

One of two car loads of Link-Belt "PD" type, heavy-duty vibrating screens, furnished for these plants, is shown.

CLEANING AND LOADING STONE WITH PORTABLE LOADER



R. K. Kibblehouse, who operates a quarry at Perkiomenville, Pa., solved the problem of cleaning stone in ground storage, before loading to trucks, by the simple expedient of installing this Link-Belt power-propelled "Grizzly" crawler loader, equipped with a Link-Belt vibrating screen.

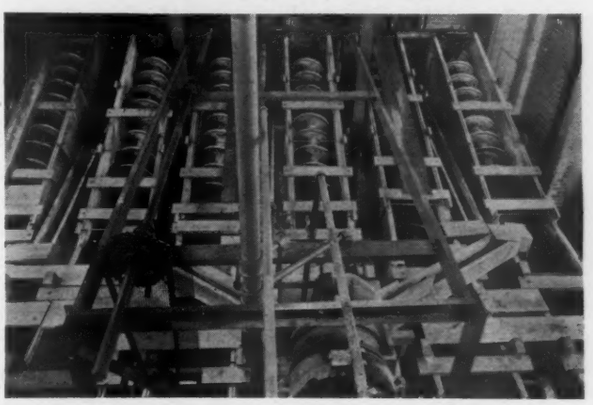
This high capacity unit feeds itself and is operated by one man. It crawls, as it digs, as it screens, as it loads. Trucks of 5-ton capacity are filled in 2 to 3 minutes with clean stone ready for transportation to points within the surrounding community.

RECOVERING PLACER GOLD FROM COLORADO'S FAMOUS CLEAR CREEK

The prospector of old who "panned" the streams of Colorado for "pay-dirt" is being considerably outdone by this modern placer gold recovery equipment. It is owned and operated by Humphreys Gold Corp. on Clear Creek, near Denver, the scene of much of Colorado's gold mining activity since 1858.

A Link-Belt K-38 shovel excavates to bed rock, and two Link-Belt draglines (a K-38 and K-48) deliver to the portable Link-Belt gravel screening stacker mounted on crawler treads. Note the large rocks in the foreground, which have been handled through the system.

WASHING INDUSTRIAL SAND FOR GLASS MANUFACTURE



Michigan Silica Company, of Rockwood, Michigan, are producers of high-grade silica sand which is suitable for optical use and plate glass manufacture. Among other equipment added to assure the purest product possible, were six Link-Belt screw-type sand-washers.

The material is crushed, and washed through several changes of water, the final operation being performed by these Link-Belt screw washers.

Send for Catalog No. 1240

LINK-BELT COMPANY

300 West Pershing Road, Chicago, or
2045 W. Hunting Park Ave., Philadelphia

Please send copy of your Catalog No. 1240.

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Rock Products 5238

Rock Products

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March, 1935

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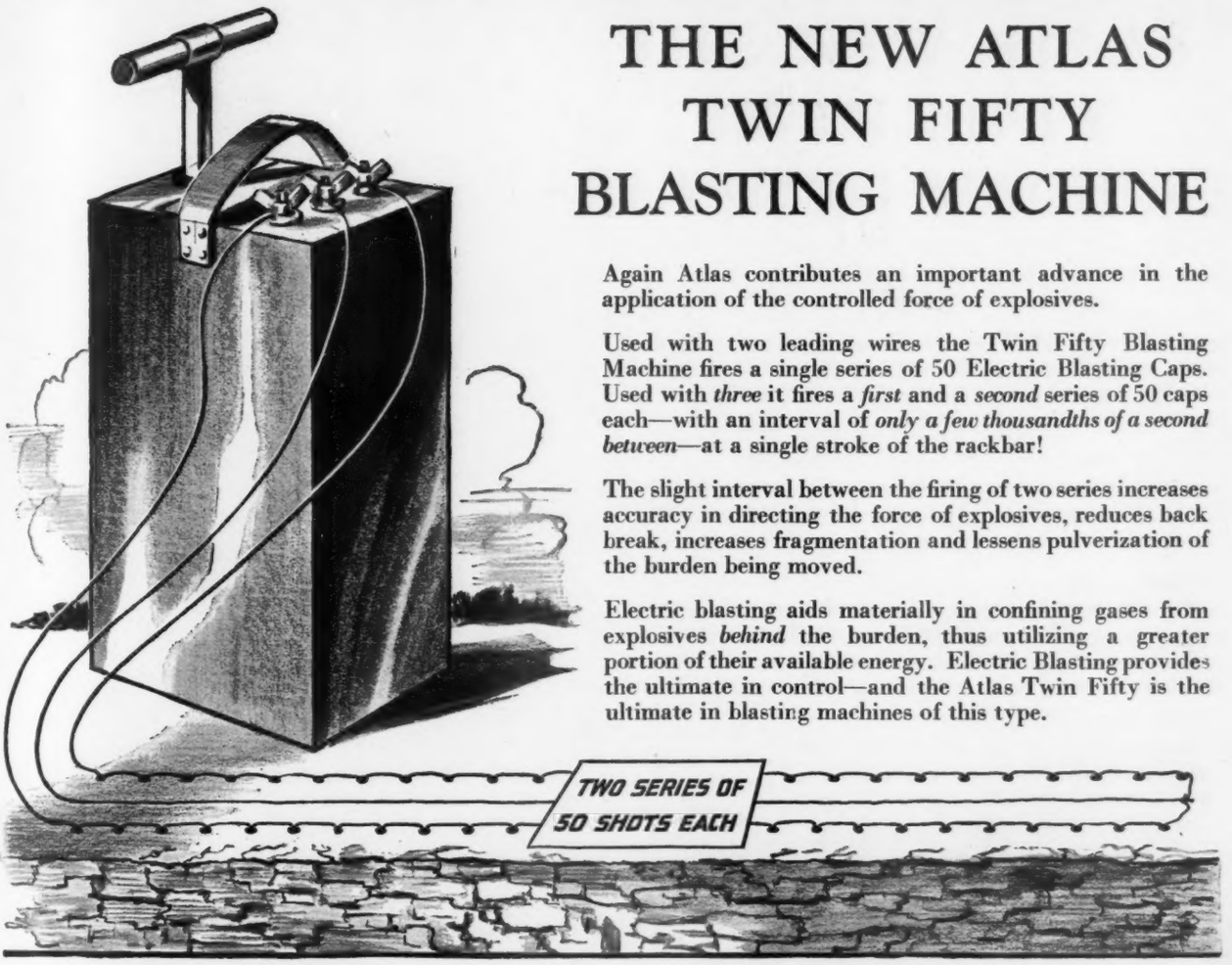
Another ATLAS FIRST



THE NEW ATLAS TWIN FIFTY BLASTING MACHINE

Again Atlas contributes an important advance in the application of the controlled force of explosives.

Used with two leading wires the Twin Fifty Blasting Machine fires a single series of 50 Electric Blasting Caps. Used with *three* it fires a *first* and a *second* series of 50 caps each—with an interval of *only a few thousandths of a second between*—at a single stroke of the rackbar!

The slight interval between the firing of two series increases accuracy in directing the force of explosives, reduces back break, increases fragmentation and lessens pulverization of the burden being moved.

Electric blasting aids materially in confining gases from explosives *behind* the burden, thus utilizing a greater portion of their available energy. Electric Blasting provides the ultimate in control—and the Atlas Twin Fifty is the ultimate in blasting machines of this type.

Atlas 2-B
1-10 Electric Blasting Cap Capacity

Atlas 3-30
1-30 Electric Blasting Cap Capacity

Atlas 3-50
1-50 Electric Blasting Cap Capacity

Holes may be properly located and spaced. They may be right in size and depth. But—the final result may depend on your blasting machine.

The price of a good blasting machine represents only a small fraction of the cost of most blasting operations. Here are pictures of other Atlas Blasting Machines. Each is designed for high capacity, rugged service and ease of operation. Consult the Atlas representative.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

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Everything for Blasting

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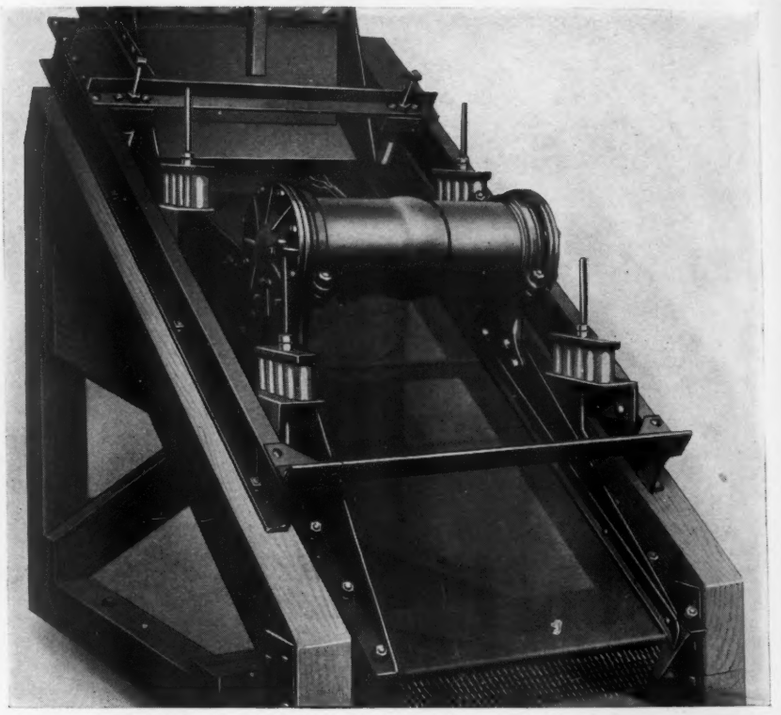
EXPLOSIVES

SKF *Roll Smoothly With*

SCREEN SPEED

At 60 Vibrations a Second

● SKF makes practically *all types of anti-friction bearings.* When SKF recommends a particular type of bearing, therefore, you may depend upon it; its recommendations are *unbiased!*



SKF-EQUIPPED BUILT BY GIFFORD-WOOD CO.

SIXTY VIBRATIONS A SECOND . . . that's what this SKF-equipped motor . . . turning at 3,600 R.P.M. . . . sends through the above Mitchell Electric Vibrating Screen. And it's this ability that leads Gifford-Wood to say SKF are "the most accurate and highest grade ball bearings we can secure". . . that increases the value of their screens.

SKF Ball Bearings give screens . . . as they give pumps, compressors, crushers, or any other type of equipment that runs on bearings . . . the efficiency that eliminates congestion, delay, idleness, and loss of production. They're practically wear-proof . . . need no adjustment . . . and require inspection and lubricant replenishing only a few times a year. Therefore, when you buy or when you specify any equipment that has bearings . . . make sure the bearings are SKF! SKF INDUSTRIES, INC., Front St. & Erie Ave., Philadelphia, Pa.

SKF
BALL AND ROLLER BEARINGS 3354

The Greeks had a use for it—but they didn't have MONARCH WHYTE STRAND

"60% Longer Service"

A Missouri contractor reports that the first length of Monarch Whyte Strand (¾" 6 x 19) he used on his shovel gave him 40 days' service. The rope he had previously been using gave a maximum of only 25 days' service. Result—he ordered 4 more lengths of Monarch Whyte Strand for immediate delivery.

"Unloaded 360 Barges"

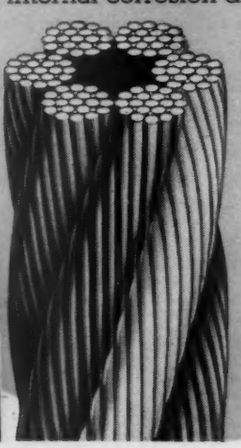
Monarch Whyte Strand (⅞" 6 x 19) was recently installed on a clamshell bucket unloading sand and gravel barges on the Potomac River. The rope was finally retired after it had unloaded 360 barges! This exceeds by a substantial margin all previous records made by all other Preformed ropes.

MACWHYTE COMPANY, KENOSHA, WIS.

Manufacturers of a complete line of wire ropes for shovels, drag line excavators, slack line excavators, quarry derricks, digging and bucket hoist lines, clamshell cranes.

Get the facts about this Triple-Feature Wire Rope for today's toughest jobs...

● Monarch Whyte Strand is made for tough assignments—made for jobs where maximum strength and dependability are essential. **1.** High stamina is guaranteed by careful heat treating and drawing of each individual wire. **2.** A special kind of permanent internal lubrication protects each wire in the strand from internal corrosion and internal friction. **3.** *Preformed* construction withstands bending with minimum strain. See Monarch Whyte Strand performance records at left. And write for free sample, catalog and complete data.



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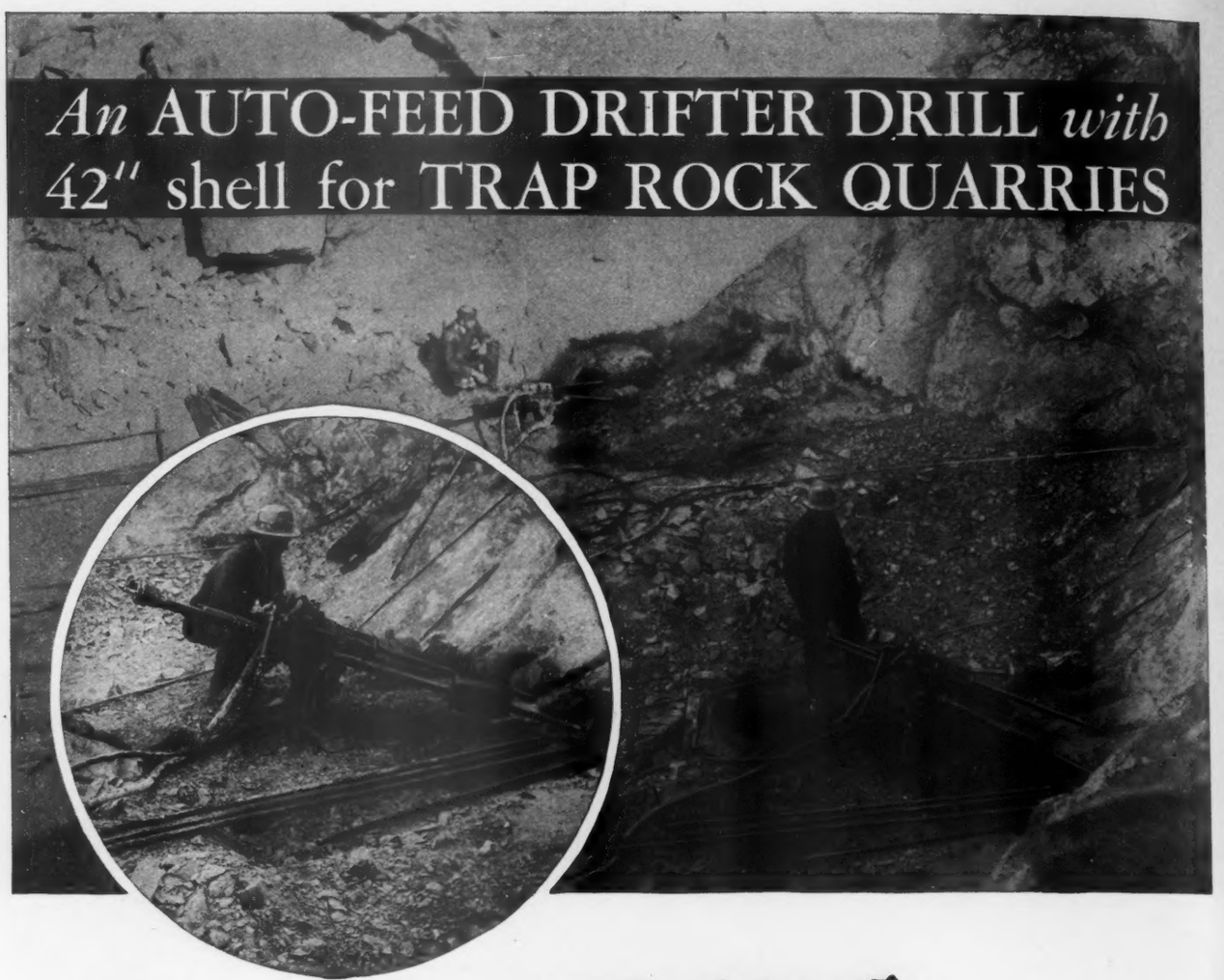
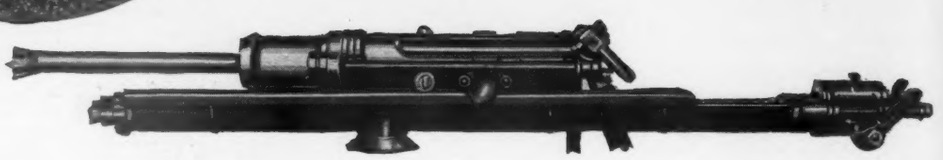
MONARCH WHYTE STRAND—PREFORMED and Internally Lubricated Wire Rope

An AUTO-FEED DRIFTER DRILL *with* 42″ shell for TRAP ROCK QUARRIES



I-R Auto-Feed Drifter Drills at work in the Stony Brook Quarry of the Massachusetts Broken Stone Company, Stony Brook, Mass.



A RECENT development for trap rock quarries — the I-R Auto-Feed Drifter Drill with a feed shell of 42 inches.

I-R Auto-Feed Drifter Drills are proving their adaptability for quarry work and are being employed successfully for all sorts of drilling conditions, including horizontal and down hole drilling through seamy and shattered formations where the rock has previously been shot over.

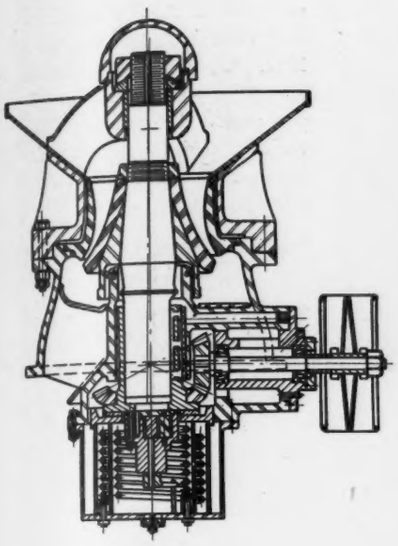
With the Auto-Feed Drills, feeding is completely automatic in all positions. This insures more footage per shift. The drill continues to work while the runner sorts his steel and gets ready for the next hole. Being relieved from hand cranking, the operator is as fresh at the end of the shift as at the beginning. Absolute safety for the runner in all drilling positions is another advantage.

These are just a few of the reasons why you will be interested in the I-R Auto-Feed Drill. There are others. May we tell you about them?

Ingersoll-Rand

11 BROADWAY. NEW YORK CITY

96-5



Only 51 inches high, but a Mighty Money-Maker —— TY Reduction Crusher

HERE'S a little wonder-crusher—with 20″ dia. head —3″-4½″ receiving opening—weighs about 9,000 lbs.—uses not over 25 H.P.—delivers as fine as ⅛″ product.

All cast-steel frame and all of the exclusive features of the Bulldog and TZ Crushers, including the Traylor Original, Patented, Non-Chokable Bell Head and Curved Concaves.

Note this screen analysis, crushing trap rock, 4½″ feed opening, 7/16″ discharge opening, 30 tons per hour:

Thru	%	Thru	%
1″	92.53	⅜″	36.40
¾″	79.48	⅛″	21.68
½″	50.00	1/16″	14.60

Costs little to buy—pays big dividends! Send for our new descriptive Circular No. 1001, or have our man around to talk it over.

CRUSHER ON TESTING FLOOR — ALL TY CRUSHERS ARE COMPLETELY ASSEMBLED AND SHOP TESTED BEFORE SHIPMENT.

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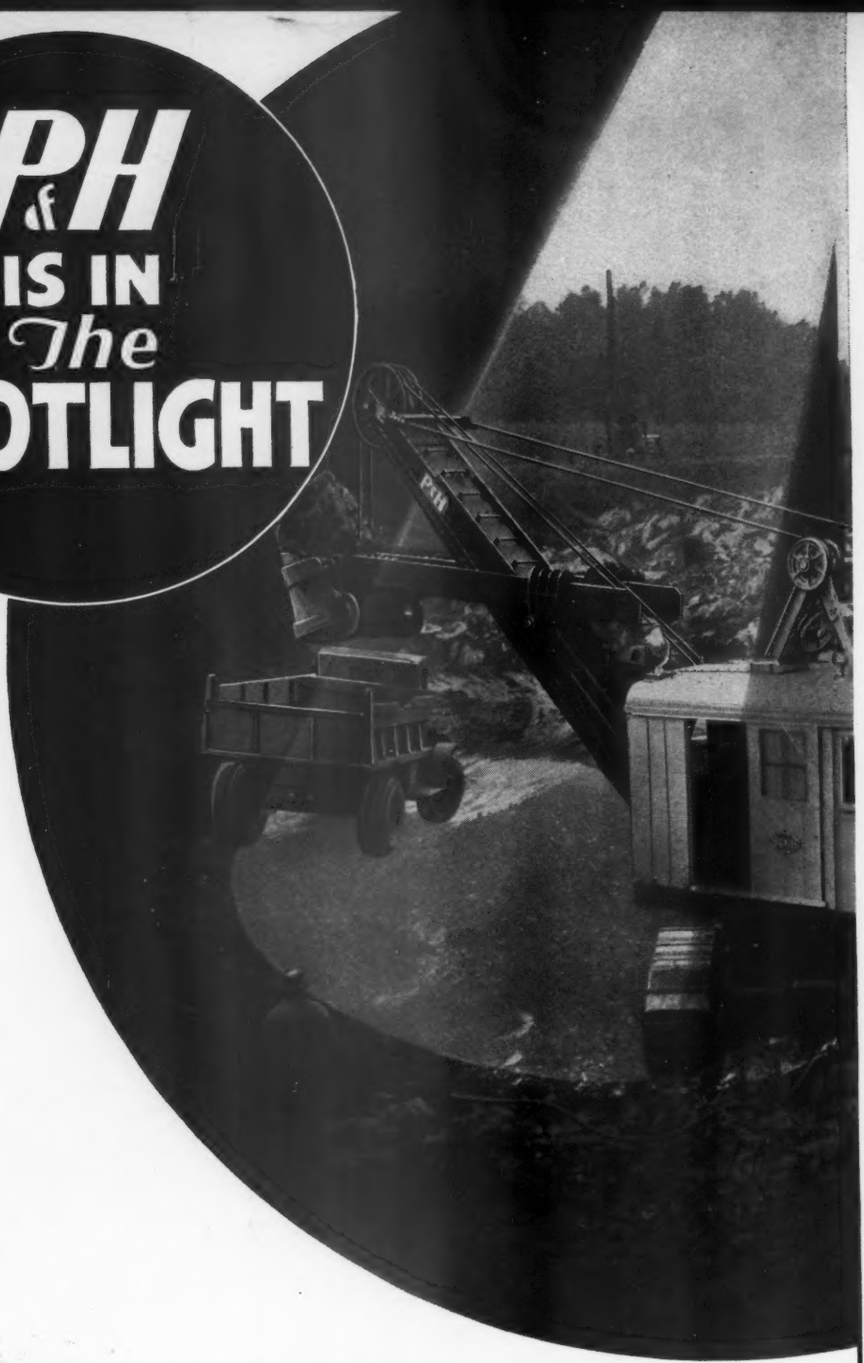

AS AMERICA'S MODERN CEMENT MILL Gets Under Way

There's the last word in cement-making methods at the new plant of the National Portland Cement Company at Brodhead, Pennsylvania. And with this P&H 1200 WL, there's the last word in equipment, too. . . . Even before buildings were completed, this machine was on the job . . . toting steel beams . . . lifting 37-ton parts for crusher assembly . . . grading for ramps . . . gearing up for quarry operations in general. . . . That sample of P&H performance was enough. Fast, continuous production is the demand on excavators to keep pace with America's most modern cement plant. That's why a second P&H 1200 WL went to Brodhead.

Equipment Selected for High Production

Representing an investment of $2,500,000, the facilities of the new plant of the National Portland Cement Company at Brodhead, Pa., provide capacity of one and a quarter million barrels per year. All equipment has been selected to meet the demands of sustained high production.

Faster Operating Speeds For Excavators

To maintain a continuous supply of rock for the crushers, P&H Ward Leonard machines were selected. Faster operating speed is accomplished through high over all horsepower and a more advantageous distribution of weight. The carefully grouped machinery units behind the center of rotation act as a natural counterweight and do away with much of the dead-weight which would otherwise be required. It means a consequent increase in operating speeds with maximum power efficiency.

Swing Increased to 3½ R. P. M.

The P&H swing units, built on the modern vertical motor, helical gear principle, speed the swing up as fast as 3½ R.P.M. On the 4 yard swing units operate in parallel, each sharing one-half of the torque required to rotate the machine. All gears and shafts are mounted on anti-friction bearings and sprayed with oil from a separate, high pressure pump.

Simplified Control by Push Buttons

In the interest of faster, simpler operation, all movements of the P&H Ward Leonards are electrically controlled, eliminating hand levers and manually operated foot pedals. This applies to steering as well, which is accomplished through the use of electrically operated hydraulic cylinders. Travel speeds up to 1½ M.P.H. are unusually high for machines of 2, 3 and 4 yards capacity. • Ask for catalog WL-1.

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4465 W. NATIONAL AVE. *Established 1884* MILWAUKEE, WIS.

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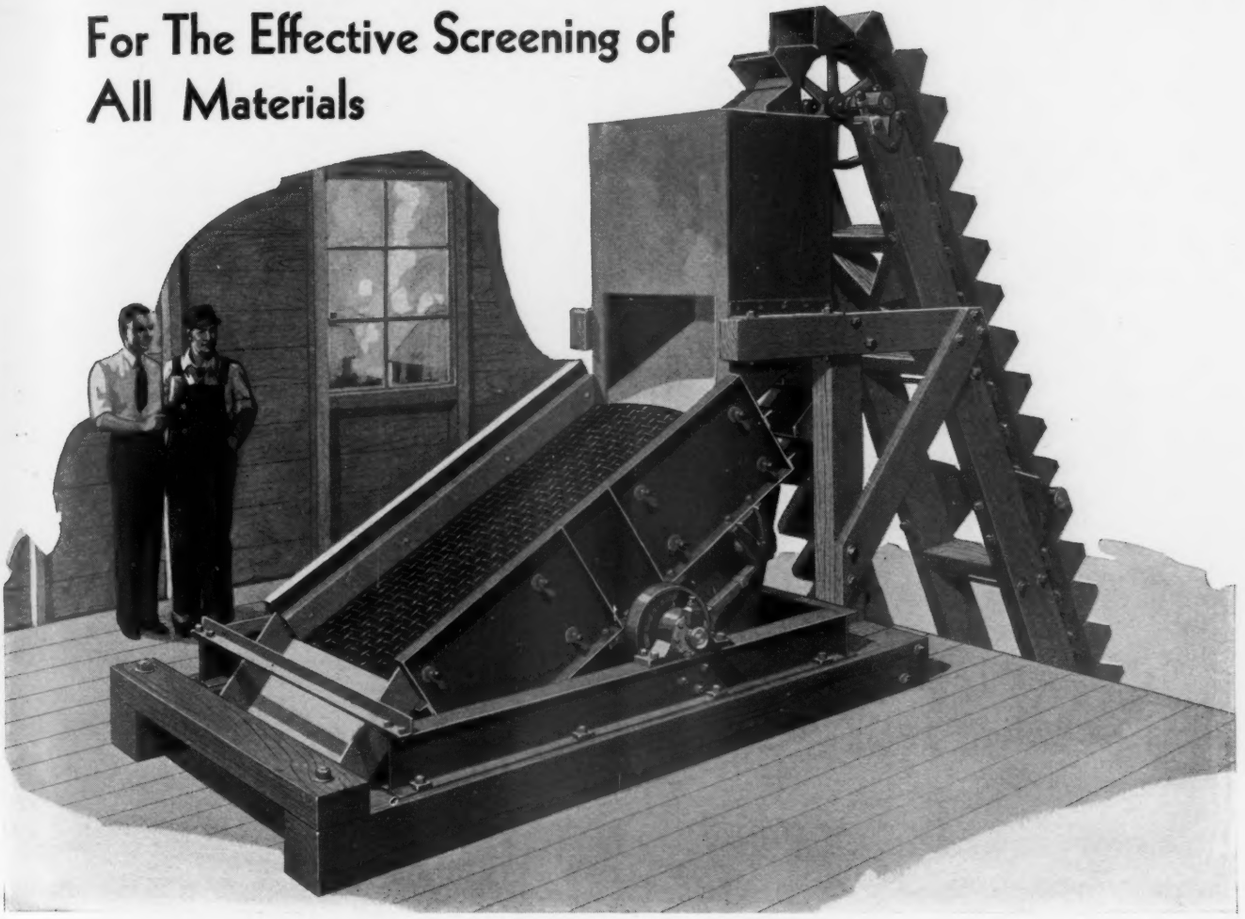
P&H WARD LEONARD ELECTRIC EXCAVATORS

LINK-BELT
VIBRATING SCREEN

For The Effective Screening of All Materials



1 Mechanically operated with few moving parts, resulting in low operating and maintenance costs.

2 No dead screening areas. Method of imparting uniform intensity of vibration, results in maximum efficiency, capacity and long life.

3 The screen cloth is entirely unobstructed, permitting free passage of material. Especially well adapted for the application of water sprays when washing, because of the uniform beds of material running down at a steady rate.

4 Angle of incline of screen can be readily changed to suit conditions.

5 Heavy combination coil and leaf spring assemblies maintain angle of incline, absorb shock loads and prevent side sway while conforming to circular motion of vibrator.

6 Only the screen cloth needs to be removed when cloth replacements are necessary. Simple and easy.

7 Mounted on substantial steel base permitting supporting below or suspension by cables.

8 All bearings are exact duplicates, and are of the self-aligning roller type, enclosed in dust-proof housings.

Rock Products 5223A

LINK-BELT COMPANY, 2045 W. Hunting Park Ave., Philadelphia, or nearest office

Please send me a copy of Book No. 1462.

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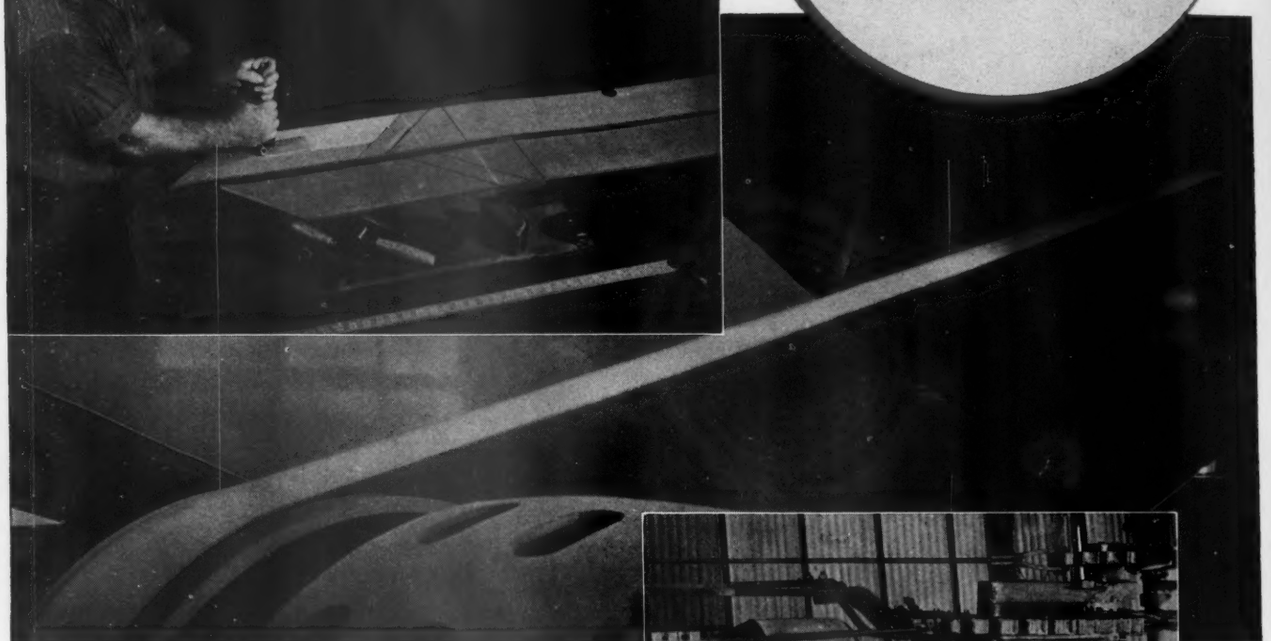
Endless Rubber Belts Now Practical on 85% of Drives



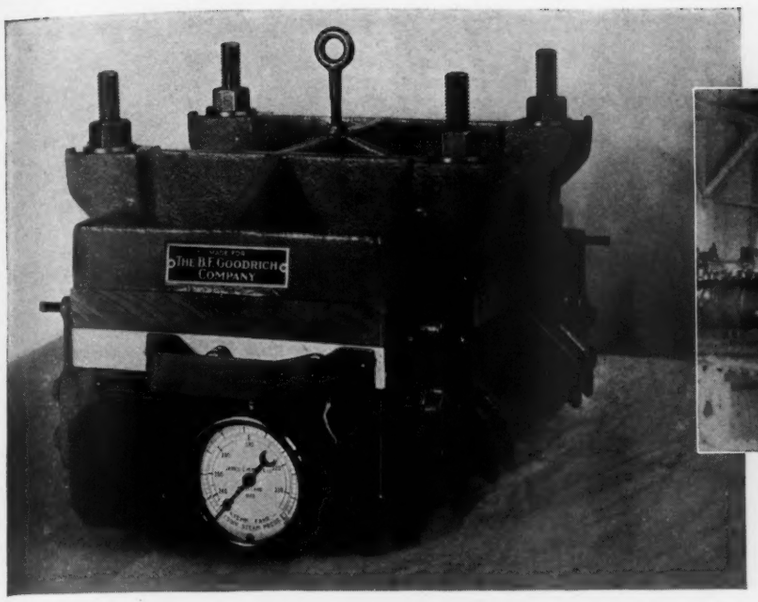
TOP—*Second step in making the new Goodrich Plylock Splice. The tools shown are the only ones needed for the complete operation.*

CENTER, ABOVE—*Highflex, driving a suction fan at a mine in the northwest. Operating conditions are extremely dusty but this 14" endless Highflex belt—which replaced 20" leather—has never been off the drive since April, 1930.*

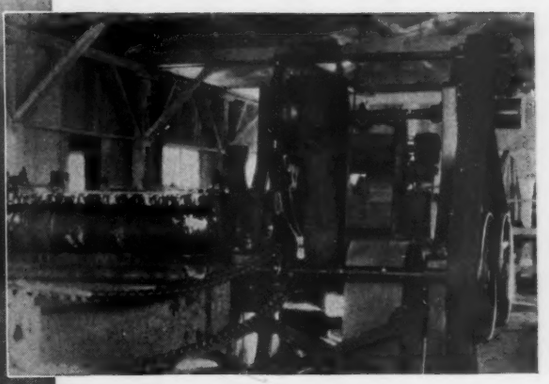
ALL *products problems* **IN RUBBER**

Endless Highflex Belt driving a band-wheel power in the oil fields. This belt has been adopted as standard by company after company, because of its years of trouble-free service.

Goodrich



Portable vulcanizer used in making Highflex Belts endless, on the job, by the Plylock method.



Highflex Belt (driving from below), made endless on the machine, in a southern lumber mill.

ENGINEERS know that endless belts invariably last 2 to 3 times as long as those with fasteners, and reduce belt cost, deliver more and steadier power, reduce idle machine and employee time. But endless belts have been impractical on most drives, impossible on many.

Now endless rubber belts are practical on any drive with take-up and on many without. With the new Goodrich Plylock Splice* and the portable vulcanizer which Goodrich sponsored, any mechanic can easily learn to make a Highflex rubber belt endless, and then vulcanize it on the machine in a few minutes to a few hours, depending on size of the belt. The belt can be used as soon as it is vulcanized—there is no waiting for cements to set.

Belts made endless in this way will eliminate 90% of the joint trouble you have formerly had with the best rubber or leather belts, and on most drives will last 2 to 3 times as long.

Good rubber belts seldom fail—the failure has been at the fasteners or at the outside seam in the splice. The new Plylock method does away with fasteners, and gives you a splice in which the outside seam is carried under the surface and protected from wear, strain and windage. This Plylock Splice is better and safer than any leather or rubber splice ever made before, in the factory or in the field.

For such a revolutionary improvement you might expect to pay a high premium, and it would be worth it. But the only cost is a portable vulcanizer ($45 up depending on size). Or your Goodrich Distributor can do the work for you at a reasonable charge.

Call your Goodrich Distributor now. Plylock can begin tomorrow to cut belt costs in your plant.

The B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio.

*Patent applied for

Highflex Endless Belt on crusher drive. Any drive with take-up can now have the economy and long life of endless belts by means of the Goodrich Plylock Splice and portable vulcanizer.

Highflex Belting

We are so sure you will find Highflex Belt better, and will want to be able to identify it so you can reorder, that we give it a permanent brand—the *red edge*—the mark of the belt with the 14 new improvements.

KOEHRING

KOEHRING Heavy Duty Construction — Easy and positive steering in any direction, by lever control from the cab — self-equalizing double outside band friction clutches — low ground pressure — swiveling boom point fairlead for reducing cable wear—*all important features for dragline work* — available with a Koehring Dragline.

The Koehring boom point fairlead saves cable by eliminating cross pull and self-aligning cables regardless of bucket position.

KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks

3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

HIGH EARLY-STRENGTH CEMENT

CONCRETE evidence of the superior results, obtained with whizzer separators on cement, again is shown by a recent Raymond installation for classifying finish clinker.

On this job, a 16-foot Raymond Mechanical Air Separator, operating in closed circuit with a 3-compartment Traylor mill, is setting new records in the production of high early-strength cement.

The mill delivers to the separator a product showing 85% through 200-mesh. The separator rejects the coarser material, and makes a finished product that tests:

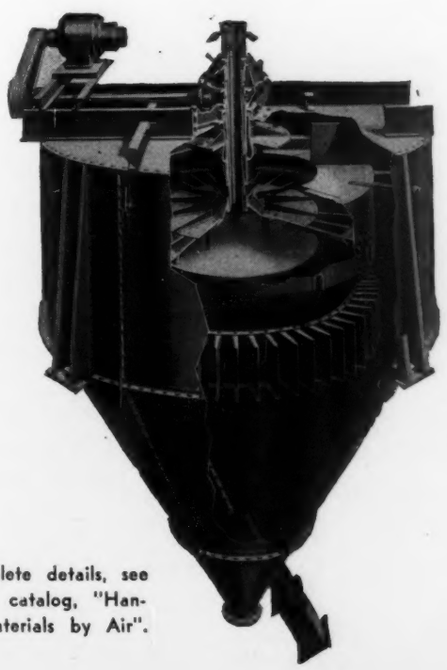
99.9% plus passing 200-mesh
88.0% finer than 25 microns
78.0% finer than 20 microns
68.0% finer than 15 microns

The excellent quality of this cement is indicated by the following tests for tensile strength:

1 Day	363
3 Days	426
7 Days	483
28 Days	550

Besides producing better quality of high early-strength cement, the 16-foot Raymond whizzer separator is giving extra large capacity, averaging 80 barrels per hour and saving 8 horsepower per barrel for grinding, separating and conveying.

If you first compare performance, your final choice will be a Raymond whizzer-type Mechanical Air Separator.



For complete details, see Raymond catalog, "Handling Materials by Air".

RAYMOND BROS. IMPACT PULVERIZER CO.
Division of Combustion Engineering Company, Inc.
1307 North Branch Street CHICAGO
Sales Offices in New York and Los Angeles
Canadian Representative: Combustion Engineering Corp., Ltd. Montreal

RAYMOND
PULVERIZING • SEPARATING • FLASH DRYING • DUST COLLECTING

WHAT DO YOU MEAN • • *More Work?*

Just that! With Cordeau-Bickford Detonating Fuse each cartridge has the added force of a primer cartridge—"goes" with its maximum force—does more work. This is because the Cordeau is in intimate contact with all the cartridges in a hole and acts as an individual detonator for each.

You can use fewer but larger shots—drill all the holes at one time, hook up with Cordeau and fire them all at the same time. Shots can be planned to give a maximum amount of rock through successive relief of burden.

Thus Cordeau not only results in *more work*, but its use generally means better fragmentation, easier removal.

But *more work* is only one way in which Cordeau pays. Learn the others! Watch succeeding advertisements or write to us. THE ENSIGN-BICKFORD COMPANY, Simsbury, Connecticut. *Estab. 1836.*

CORDEAU DETONATING FUSE BICKFORD

ALSO SAFETY FUSE *Since* 1836

THE ENSIGN-BICKFORD COMPANY

CB-40

Rock Products reaches more plants than any other paper

THE NEW TELSMITH PULSATOR

Made in 8 sizes—
single, double and
triple decks.

—A BETTER BUILT HEAVY DUTY VIBRATING SCREEN

Sand, gravel, crushed rock, ore or coal . . . wet or dry . . . the new heavy duty Telsmith Pulsator is designed to screen them all *uniformly.*

The eccentric action of the pulsator produces a circular movement which makes the aggregate literally dance over the wire. The movement produces a maximum screening action, uniform on *every inch of the wire,* on *every deck* and under *any load.*

Unlike other vibrators, the frame is *horizontal,* more compact, rigid and easy to install. The shaft is journalled in a complete, self-contained independent unit . . . mounted on the frame . . . with the screen decks easily unbolted therefrom. The vibrator unit may be readily removed and taken apart in the field so that repairs, when they finally become necessary, may be made with the utmost convenience.

The nested springs are centrally located, to assure uniform support at all points of the deck. These springs carry practically all the load of both decks and aggregate, thereby greatly lengthening the life of the end bearings.

Construction is typically Telsmith—utilizing the toughest alloy steels, the finest anti-friction bearings, special labyrinth and piston ring seals for the protection of working parts. Thus greater value, in the form of longer life and lower upkeep, is built into the Telsmith Pulsator.

Bulletin V-11 gives complete details. It also contains the first table ever published by any manufacturer for figuring the capacities of vibrating screens of any size and any make.

SMITH ENGINEERING WORKS, 508 E. Capitol Drive, Milwaukee, Wis.

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NEW YORK CITY

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CHICAGO, ILL.

130 S. 15th St.
PHILADELPHIA, PA.

1109 Statler Bldg.
BOSTON, MASS.

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Brandeis M. & S. Co.
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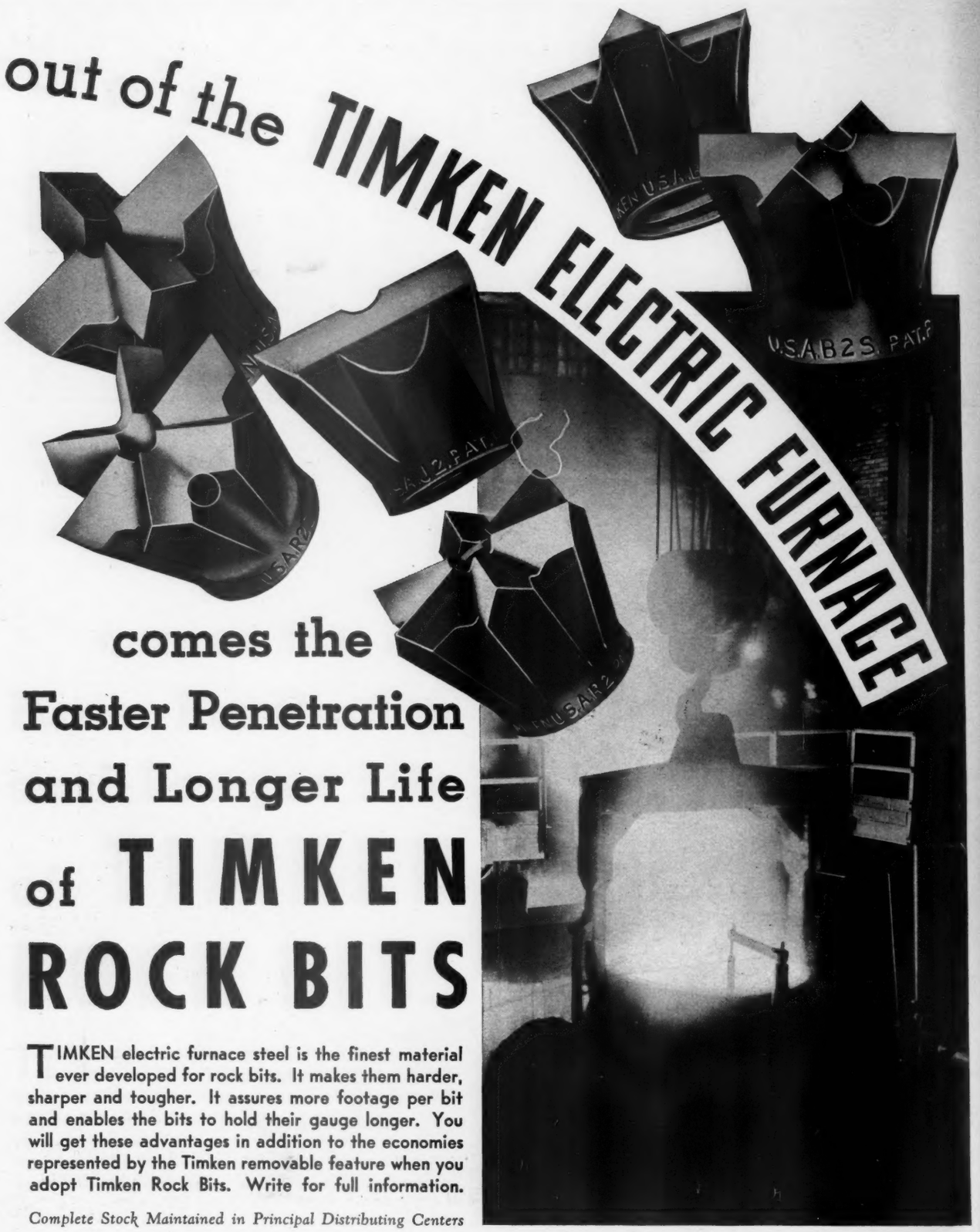
TELSMITH

out of the TIMKEN ELECTRIC FURNACE comes the Faster Penetration and Longer Life of TIMKEN ROCK BITS



TIMKEN electric furnace steel is the finest material ever developed for rock bits. It makes them harder, sharper and tougher. It assures more footage per bit and enables the bits to hold their gauge longer. You will get these advantages in addition to the economies represented by the Timken removable feature when you adopt Timken Rock Bits. Write for full information.

Complete Stock Maintained in Principal Distributing Centers

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN BITS

THE NEW PROFITABLE WAY TO SELL SAND, GRAVEL AND STONE

USE REX MOTO-MIXERS and AGITATORS

Rex Moto-Mixer feeding Rex Pumperete, which pumps concrete down 60 feet on Pennsylvania Railroad Union Tunnel at Baltimore, Maryland

To SELL THEM AS Ready-Mixed Concrete

Selling Ready-Mixed concrete is the easiest way to turn sand, gravel and stone into cash — at the same time building up a business that will insure a steady profit income.

Ready-Mixed concrete is in demand everywhere because it lowers the cost of construction. The Rex Moto-Mixer brings definite savings on practically every type of job where mixers and aggregates must otherwise be moved in.

More Pay Loads with Rex Moto-Mixers

You start faster with the pay load because the Rex Fast Charging Hatch means less Moto-Mixer time at the plant. You produce better concrete at lower costs because Rex Drum Design gives Rex Certified Concrete — Rex Moto-Mixer Design gives the Lightest Weight, the Lowest Center of Gravity, for lower fuel, truck and tire costs on the road. You cut placing time with the Rex Jackass Hoist and Jiffy Spout — 75% greater spouting range — back for more pay loads after the shortest possible time at the job.

Send for this New Book that Gives the Facts on Commercial Concrete

If you're even thinking about cashing in on the possibilities of commercial concrete business, send now for the new book "Mixing and Transporting Concrete With Rex Moto-Mixers and Agitators."

CHAIN BELT COMPANY

CHAIN BELT COMPANY
1649 West Bruce Street, Milwaukee, Wis.
Send the book on Mixing and Transporting Concrete.

Name.....

Firm.....

Street.....

City..... State.....

Forged steel— Heat treated GRINDING BALLS

THE grinding requirement of maximum outputs to a determined fineness of finished product depends on the quality of the grinding media used.

Quality in LORAIN GRINDING BALLS is the sum of new steel rolled to definite specifications, plus controlled heat treatments, plus the application of determined chemical and physical properties of steel to a knowledge of your grinding requirements.

A purchase of LORAIN BALLS consists of no other obligation on the part of the buyer than assurance of satisfactory results in your grinding, at lowest possible costs.

We also design and manufacture to your requirements, ball and tube mill linings in Manganese Steel, Chrome Nickel Steel, Chrome Nickel Molybdenum Steel or in White Iron Castings.

Balls for cement, ore or other grinding, can be furnished very promptly in the following diameters—

½" - ⅝" - ¾" - ⅞" - 1" - 1¼" - 1½" - 2" - 2½" - 3" - 3½" - 4" - 4½" - 5".

THE LORAIN STEEL COMPANY

General Office: 545 Central Avenue, Johnstown, Pennsylvania

Sales Offices: Atlanta, Chicago, Cleveland, Houston, New York, Philadelphia, Pittsburgh and Denver
Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco, Calif.
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IT'S power at the dipper teeth that counts. That is why Bucyrus-Erie builds for straight-line power transmission . . . eliminates unnecessary sheaves and rope bends. That's the "why", too, for the long upper boom section, the wide-spread outside handles that thrust the dipper firmly into the bank and the wide rock-dipper with its teeth set at the best digging angle and its top clear to let the rock in . . . fast. The Bucyrus-Erie kind of power is the power that counts for profits.

power

BUCYRUS ERIE

BUCYRUS-ERIE

EXCAVATING, DRILLING, AND MATERIAL-HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN

"LAY-SET PREFORMED is the best closing line by a damn sight—*and you can quote me*"

Said this clam-shell bucket operator: (*Name on request*)

"For 5 years we have used Lay-Set Preformed closing lines on this bucket—and I'll tell you that Lay-Set Preformed is the best closing line by a damn sight . . . and you can quote me."

"Just what do you mean?" we asked.

"Just this," he replied: "We used to reeve *non*-preformed wire rope on this bucket. And the average service of such ropes was 10 weeks. *This* line—Lay-Set Preformed—gives an average of *12 months.* And believe me, mister, that's a lot of difference—especially when you have to stop and cut eight or ten feet off the end of the line and re-string your bucket. Believe me, I appreciate Lay-Set, and we're going to stick to it."

Lay-Set Preformed wire rope has been giving equally satisfactory service to wire rope users in every industry for years. If you are not getting the consistent, willing service of Lay-Set Preformed—write today for full particulars. We have an interesting booklet called "12 Burning Questions" which we will be glad to send you. Or, better still, we will send you a sample of Lay-Set with which you can prove for yourself just *why* Lay-Set Preformed lasts so much longer—gives so much greater service. Send for that sample and booklet—today.

HAZARD WIRE ROPE COMPANY, *Inc.*, Wilkes-Barre, Pennsylvania

In Business for Your Safety

District Offices: New York Chicago Philadelphia Pittsburgh Ft. Worth San Francisco Denver Los Angeles Birmingham Tacoma

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ACCO

LAY·SET* *Preformed* Wire Rope

*** PREFORMED ROPE IS MADE IN ALL TYPES, GRADES, CONSTRUCTIONS AND LAYS**

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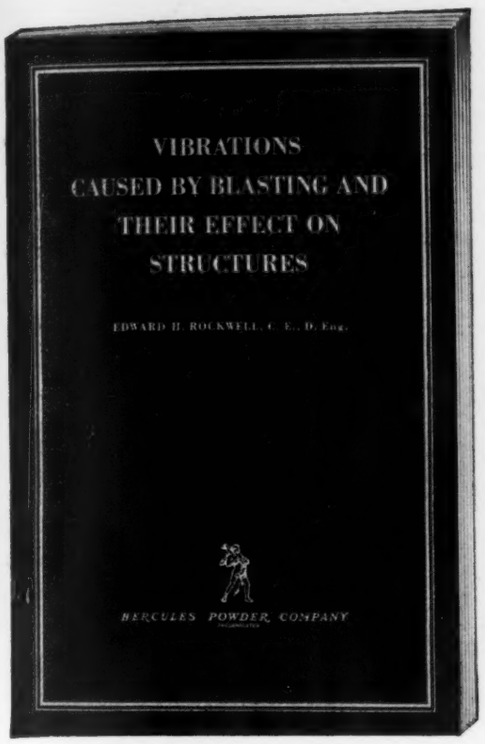


FREE TO OFFICIALS

"Vibrations Caused by Blasting" is a technical book, prepared for operating officials, engineers, and consultants. Please use your letterhead when requesting copies.

THE THIRD EDITION OF THIS IMPORTANT STUDY OF EARTH VIBRATIONS CAUSED BY BLASTING

for

QUARRY, CONSTRUCTION, AND MINING EXECUTIVES

HERE is a book for men who direct operations where explosives are used. It is a technical treatise of the forces and possible effect on structures of the vibrations set up in bed rock, by well-drill blasting. It contains a thorough analysis of the mathematics involved and is profusely illustrated with graphs from which basic data were tabulated.

The author, Dean Edward H. Rockwell, is professor of Civil Engineering and director of the Civil Engineering Department at Lafayette College.

This book should be even more valuable to explosives-consuming industries than the first and second editions. It should aid many operators confronted with complaints of blasting damage, for it clearly proves that "ordinarily well-drill blasting, as usually conducted, produces motion and corresponding forces upon objects of so small a magnitude that it is practically certain no damage to buildings in the neighborhood can possibly occur, unless these buildings are within two or three hundred feet of the quarry."

HERCULES POWDER COMPANY
INCORPORATED

946 King Street, Wilmington, Delaware

A-49

Which Motor for Your Dusty, Dirty Jobs?

Synchronous motors for constant-speed loads, where you want high efficiency and power-factor improvement
Direct-current motors—Use them where you want unusually fine speed control, or where your power is direct current
Vertical motors—Use them on pumps, machine tools, agitators, etc. They save space and eliminate gearing
Gear-motors — compact, efficient, low-speed drives for your conveyors, low-speed pumps, machine tools, etc.
Squirrel-cage induction motors — simple, sturdy motors for your run-of-the-plant jobs

THE G-E TOTALLY ENCLOSED FAN-COOLED MOTOR

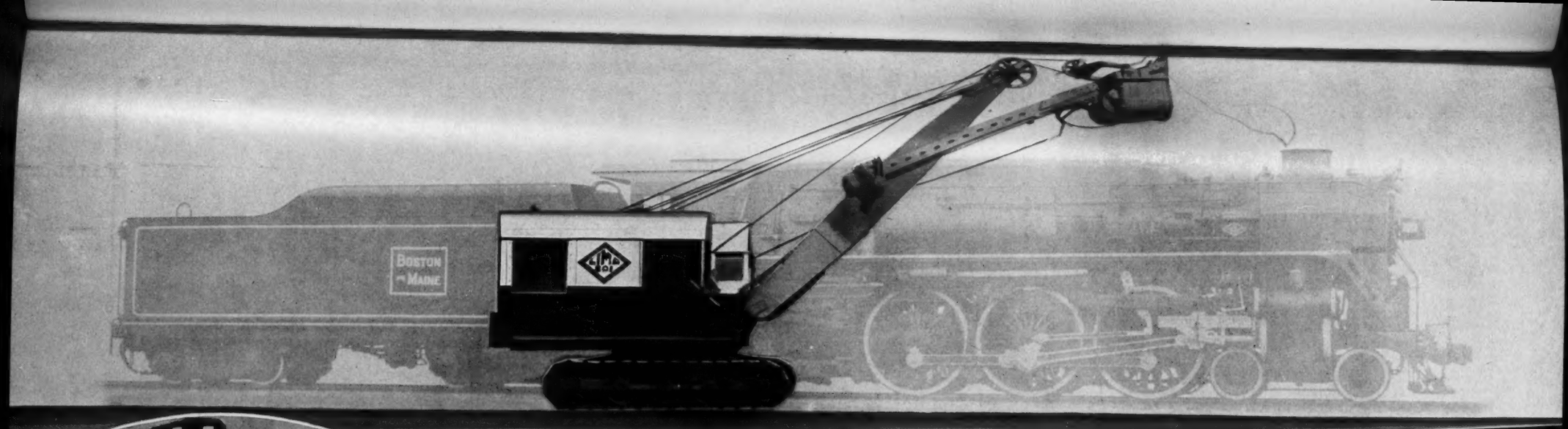
YOU can save money and obtain more dependable service by using low-upkeep G-E totally enclosed, fan-cooled motors* and dust-tight control for your jobs in dusty, dirty places and outdoor installations—jobs that would put open motors out of business in short order. Whatever type of motor your job requires—squirrel-cage induction, wound-rotor induction, synchronous, direct-current—we can supply you with the RIGHT motor, protected against dust, dirt, mild chemicals, and moisture.

Look around your plant—perhaps open motors are now being used where G-E totally enclosed, fan-cooled motors would cut maintenance costs and prevent frequent interruptions of production. A sales engineer in the nearest G-E office will gladly help you find the most profitable solution of your drive problems. General Electric, Schenectady, N. Y.

**These motors can be furnished with Underwriters' label indicating their suitability for Class I, Group D, hazardous gas locations, or Class II, Group G, hazardous dust locations.*

020-104

GENERAL ELECTRIC



OVER FIFTY YEARS OF QUALITY WORKMANSHIP IS BACK OF EVERY LIMA

The fact that expert engineers incorporated in LIMA'S complete line of excavators many exclusive and advanced features that established new standards in design, is not the only reason they have proved the most popular shovel, dragline and crane on the market today.

Skilled mechanics, trained by an experience of over half a century in the quality workmanship required in locomotive construction; manufacturing facilities found only in a plant equipped to produce giant steeds of the rails; and an organization bearing an international reputation for service after sales, combine to make LIMA shovels, draglines and cranes the standard of quality wherever excavators are used.

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LIMA

SHOVELS
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MODERNIZE TO ECONOMIZE

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This is an opportune time to modernize, to lower the cost of production and improve the quality of product, by the utilization of MODERN

CEMENT MAKING MACHINERY
CEMENT PLANT ENGINEERING

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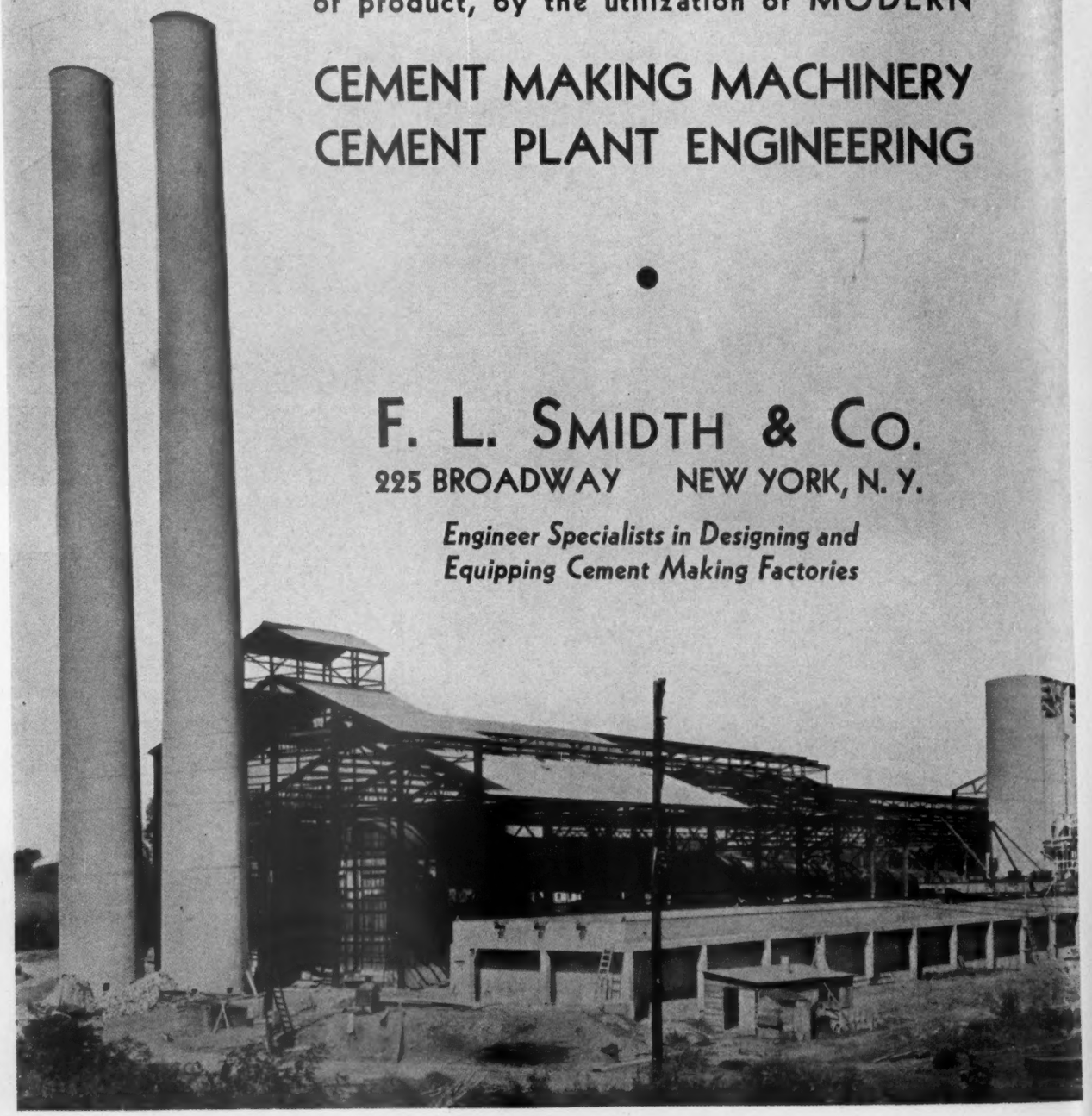
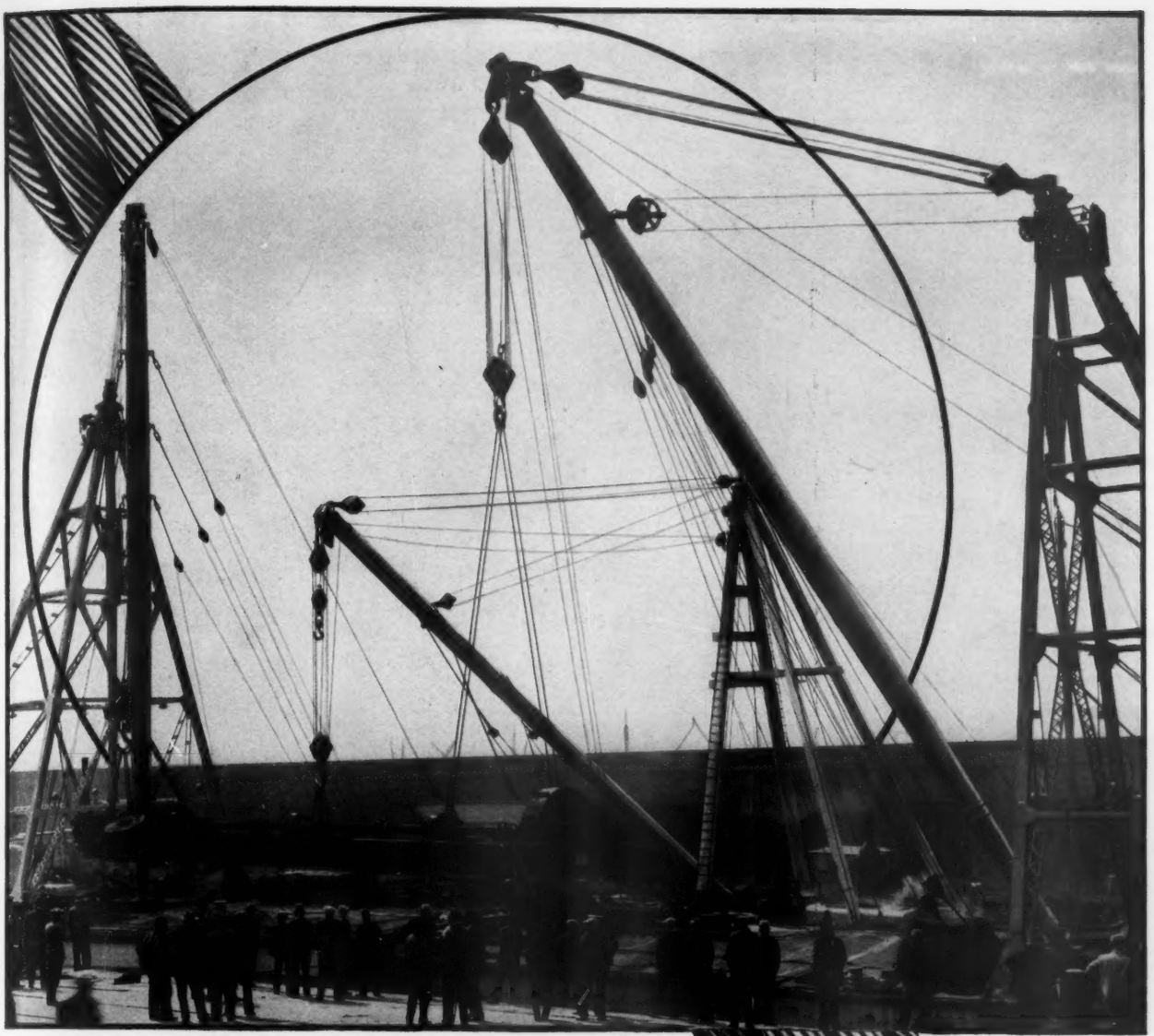
F. L. SMIDTH & CO.

225 BROADWAY NEW YORK, N. Y.

Engineer Specialists in Designing and Equipping Cement Making Factories





PROOF
IS ONLY IN ACTUAL SERVICE

It is one thing to talk about the ability of Wire Rope to "take it"—and it is quite another thing to prove exceptional ability by actual performance on the job. In every field of application—wherever the hardest of tasks are to be accomplished—the chances are you will find American Steel & Wire Company Wire Rope doing the work—doing it better—and more economically. This widespread preference is based on proved service records—and on the knowledge that no problem is so large or so small that our engineers will not welcome an opportunity to cooperate.

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Offices in All Principal Cities

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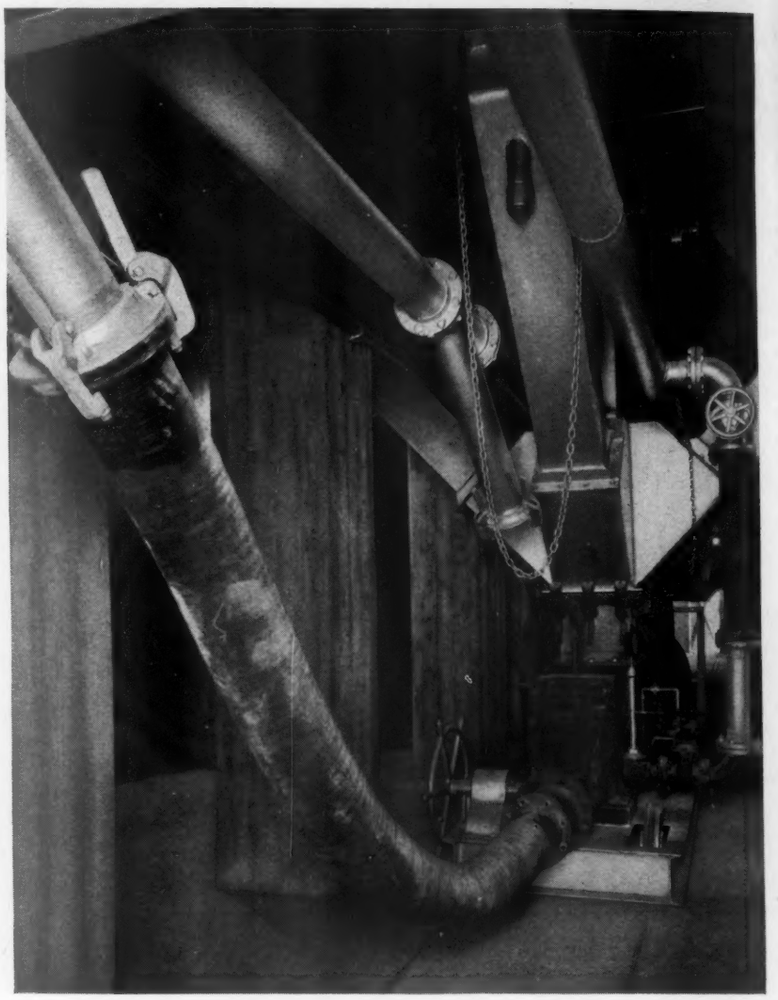
PROMPT SHIPMENTS BY RAIL OR WATER IN BAGS OR BULK



ONE OF TEN NEW PORTABLE PUMPS

in five under-silo installations. This is one of the new eight-inch Type "H" low pressure, low velocity pumps, capacity 600 barrels an hour. Simple clamping arrangements connect the pump hopper with the discharge spouts and transport line and facilitate transfer of the pump from one station to another. All working parts are readily accessible.

The following materials are commonly handled by Fuller-Kinyon Systems:

Alumina
Bauxite
Cement
Cement Raw-Materials
Chalk
Clays
Coke Dust
Feldspar
Flint
Flue Dusts
Fullers Earth
Gluten Feed
Graphite
Gypsum
Kaolin
Lime
Limestone
Manganese Dioxide
Phosphate Rock
Soda Ash
Sodium Bicarbonate
Starch

All modern demands for prompt shipments of cement are met in the installation illustrated. Cement is conveyed from the silos to the packhouse; to cars in bulk; to barges in bulk, and a return line is provided for blending or clearing a bin for special or tested cement. Two Type "H" pumps on parallel tracks, with interconnected pipe lines, provide an unusually flexible arrangement in handling shipments.

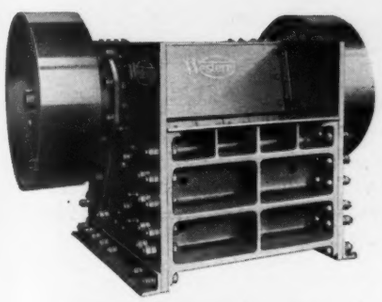
Portable pumping systems offer unequalled economy and convenience in under-silo installations. The system can be cleared quickly to handle special cements. The branch line valves can be automatically controlled. Five-way spouts permit withdrawals from as many as five bins at one station. Fuller-Kinyon Pumps are the ideal solution for the problem of rapid, clean bulk loading.

Fuller Company
CATASAUQUA, PENNA. U. S. A.

Chicago: 1118 Marquette Bldg.
Paris: E. Constantin, 105, Rue Lafayette.
Hamburg: Claudius Peters, Walhoff, Glockengiesserwall 2.

80,000 YARDS IN 70 DAYS

The Key to Austin-Western No. 100's 100-Yards-Per-Hour Performance



PRIMARY BREAKER No. 940

This jaw-type Austin-Western Crusher gives you larger capacity. With roller bearings of the finest type, it operates at full capacity continuously, without any trouble.

ROLL CRUSHER No. 3018

Supplements the No. 940 Crusher in the No. 100 Plant when fine-reduction crushing is done. Roll diameter (with manganese shells) 30 inches, face 18 inches. Speed 60 R.P.M.; horsepower 50.

Users' Confidence in No. 100 Portable Crushing-Screening Plant Backed up by Convincing Operating Records

● Davies & Sons, contractors of Abilene, Texas, are thoroughly satisfied operators of an Austin-Western No. 100 Plant. They report: "Over a period of 70 working days the plant has maintained an average of well over 1000 yards per 10 hour day, 40% crushing. Gas and oil $10 per day; repairs negligible."

"Material can be produced much cheaper with the Austin-Western No. 100 Portable Crushing and Screening Plant, than with any other I have known," says Ed. J. Murphy, Kaukauna, Wis., who has been in the gravel and crushed stone business since 1924.

Umatilla County, Oregon, writes: "The No. 100 Plant has crushed a total of 28,078 cubic yards to 1 inch minus from pits averaging about 85% oversize, a total of 330 cubic yards per day for the 85 days the plant has been started. This plant has been moved and set up three different times. It takes an average of one and one-half days to move five or ten miles and start crushing out of a new pit. Enables Umatilla County to produce more yardage for less cost per yard than we were able to do with the non-portable equipment. The savings on moves, set-ups and increased yardage will more than pay for the No. 100 Plant in two seasons."

"1500 yards in 10 hours; $10 labor costs." "Average capacity for 10 hours is 1200 yards, and if crushing does not exceed 25% same can be increased to 1500 yards—and I can assure you material is plenty hard. Three men can operate machine at labor cost of $10 per day," reports Superintendent E. S. Bowden on the No. 100 Portable Plant of the Trinity Farm Gravel Co., Eden, Texas.

Tear out and send the attached coupon today. Safest way to buy a crusher is to ask present users. Easiest way to ask users of the No. 100 is to ask Austin-Western to see their file of users' operating reports and letters. Use the coupon.

The Austin-Western Road Machinery Co.
V, Aurora, Illinois

Please: ☐ Send me complete information on the No. 100 Portable Crushing-Screening Plant. ☐ Have a representative call on me, with users' performance records and reports.

Name.....

Company.....

Address.....

City.....State.....458

ROAD GRADERS · MOTOR GRADERS · ELEVATING GRADERS · DRAGS

ROAD ROLLERS

Austin-Western

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SCARIFIERS · BULLDOZERS · TRAILERS · SCRAPERS · PLOWS

DUMP CARS

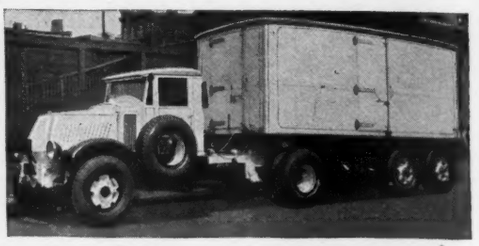
ELEVATING WAGONS

CRUSHING AND WASHING PLANTS · SWEEPERS AND SPRINKLERS · SHOVELS · CRANES · ETC · SNOW PLOWS

One ON THE ROAD IS WORTH *three* IN THE SHOP!

Let MARFAK ride your trucks!

For Short Hauls—road failures often occur at the worst possible time. Marfak will help to prevent and cure them, because it protects against wear.



For Long Pulls—road shocks are often a menace to trucks and materials in transit. Marfak will cushion the heaviest shocks with a protecting film of lubricant that won't break down.

Maintenance costs — one of your largest operating expenses — can be considerably reduced if you use Marfak.

The largest bus systems and fleet operators in the country have standardized on Marfak because it costs less to use. *It lasts three times as long* as ordinary grease lubricants.

Marfak is a superior grease-type lubricant—developed by Texaco in cooperation with the automotive industry. Its exceptionally tough film won't break down under the heaviest loads. Its unusually high "oiliness" will assure complete lubrication. It will prolong the life of your trucks. It will reduce bearing wear in steering systems, shackles, wheel bearings, universals; and this means lower maintenance costs on any vehicle.

It doesn't cost anything to find out how Marfak can help you to cut your maintenance costs. All you have to do is to write and ask for a representative to call. He will prove to you how and why Marfak should "ride" your trucks.

•

THE TEXAS COMPANY
135 East 42nd Street **New York City**

Nation-wide distribution facilities assure prompt delivery

TEXACO *tested* LUBRICANTS

REFINERY TESTED FOR UNIFORMITY • • • SERVICE TESTED FOR ECONOMY

Rock Products
With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Volume XXXVIII | Chicago, March, 1935 | Number 4

Recovery Progress—Trends—Editorial Comment

Should Any Branch of the Construction Industry Ask a Profit from Present Public Works and Relief Funds?

THE FUTURE of the construction industry, in all its branches, now rests with the President and Congress; and since all agree that we cannot have business recovery until the construction industry returns to somewhere near normal conditions, much depends on what happens to the President's $4,880,000,000 public works relief bill now being debated in the Senate—at this writing the fate of the bill looks dubious, but some kind of a public works program is inevitable. The general impression one gains from Washington contacts now is that both administration officers and members of congress are no longer so sure of their steps, and are at last open to suggestions from men of business and industry. Members of congress particularly are said to feel that they deserve more coöperation from business men and less criticism and sarcasm.

Assuming this is a true picture, business men should take the time and trouble to write their congressmen in a spirit of helpfulness. Most observers seem to agree that while this congress contains a large number of inexperienced statesmen, its mental calibre is perhaps above the average. For these reasons, a good opportunity exists for business men to exercise a truly helpful attitude. These congressmen undoubtedly receive plenty of mail and telegrams advising them to do this or that, or not to do it, but actually informative letters setting forth the problems of particular industries, or localities, and analyses of their causes and possible cures, from a public interest viewpoint, would in most cases probably be genuinely welcomed.

Recovery, Reform and Relief

Most of the present difficulties seem to arise from a badly jumbled state of mind over what are necessary measures for business recovery, for permanent reform in business conduct, and for relief of the unemployed. The President insists that all belong together in one basket, but many congressmen who have had much more business experience than the President do not appear to be so sure. As most of the plans for recovery and relief center around a revival of construction, producers of rock products are more vitally interested in pending developments than any other group with the exception of construction contractors. The cause of both is suffering from a lack of any well-defined plan.

The resolution of the Code Authority of the Crushed Stone, Sand and Gravel, and Slag Industries, at the recent Chicago meeting, expressing the views of the industries on the proposed public works expenditures, emphasizing particularly the desirability of doing this work by contract, was a step in the right direction; but it should be followed up by every individual producer writing his views to his congressmen. This is the most vital point in the whole program, and if producers will lend a hand to the contractors in their fight against government day labor, there is reason to believe the contractors will reciprocate by helping producers in their fight on government-owned sand and gravel and crushed stone plants.

The case of these two branches of the construction industry is identical and there should be no hesitation in making it a common cause throughout the country. At the same time, we must be realists in meeting the issue that is raised. We must recognize the increasing indebtedness of national, state and local governments, the increasing difficulty in collecting taxes, the burden of carrying millions of unemployed, on the one hand, and a sincere desire on the part of public officials to make every dollar go as far as possible for the relief of these unemployed, on the other hand. These officials cannot see yet where a dollar going to the profit of a contractor or material man is not to be begrudged, and avoided if possible.

The Profit Motive?

Recognizing these conditions, both contractors and material men should at least be modest in their expectations of immediate profits and whole-heartedly lend their own efforts to bring about a start toward recovery first. It might even be good statesmanship to offer openly and publicly to do all government work for the next year or

two at cost, without expectation of any other profit than keeping their organizations intact and contributing that much to the recovery effort. There probably isn't much profit in a great deal of this government work now, but such as there is the contractors and material men perhaps could well afford to rebate to the government for the general good—to be used for more construction.

The government (national, state and local) must be weaned from this effort to combine relief with construction through direct hiring of multitudes of inexperienced and unfit men in an attempt to build things merely to give employment. It is absurd on the face of it, to any man connected with the construction industry, to think for one minute that any kind of construction work undertaken in New York City, for example, can provide employment directly for a million or so unemployed clothing workers who know only how to make shirts or women's panties. The only way these unfortunate victims of the depression can be reëmployed is by a country-wide demand for new shirts and panties; and the only way that demand will come about is through the earnings of people employed at fair wages the country over.

A good start at putting people back to work in all the industries would be made by undertaking only useful and necessary public works, and to construct these by contract as has always been done, leaving the competent contractor and material man free to pick their labor from those who need it and are capable. The money thus spent would soon find its way into general circulation and provide employment in mills and factories of every description. This, according to all that comes out of Washington, is what is devoutly hoped for, but these hopes and public expressions of policy are in direct opposition to the methods the administration proposes to employ to bring them about.

The sticking point, and apparently the only one, seems to be a fear on the part of government that some of this so-called relief money will become profits to industry. Of course, profits to industry are essential to ultimate recovery, but are they immediately necessary? Wouldn't it be good industrial statesmanship to publicly and sincerely offer to waive all profits in the construction industry for the next year or two in return for government returning to a sound and business-like attitude toward public works construction?

A lot of our past and present troubles have come from an unwillingness to make any voluntary personal sacrifices; business and industry have made aplenty that have been forced upon them, but for these they get no credit, and a great deal of abuse. Of course, it can be argued, with sound basis, that stockholders in construction industry enterprises must be considered, that their losses must be recouped, that their buying power is a real factor in recovery, etc. It might also be asked, with merit, why should the construction industry be the goat, when some other industries are earning good profits? The answer to this one is that other industries get their profits from government expenditures by more indirect methods, and not by actually taking a slice of the relief money. So, it may be in the best interests of the stockholders to forego profits a while longer in order to preserve their investments against wholesale government competition, which once established, with all the political organization that goes with it, will be difficult ever to rid the country of.

This suggestion may appear visionary, but it seems like a fine opportunity for the construction industry to put government "on the spot," and to win universal acclaim and goodwill, by coming out as a unit and offering to undertake any public works by contract for no profit.

Details of New NIRA Up to Congress

Unlike other "suggestions" of the President for new legislation, he has offered Congress nothing specific in regard to a renewal or revision of the National Industrial Recovery Act, other than that the act in some form should be continued for two years. Here is another reason why all men of business and industry should cultivate friendly and, if possible, intimate relations with their congressmen. For the President is extremely vague on the most important parts of the NIRA as it bears on orderly business recovery. The codes were specifically intended to allow industry to do some things that might possibly conflict with previous and possible interpretations of the anti-trust laws. Industry has been led all along to believe that these anti-trust laws would be revised in the light of new experience in coöperative business and industry. But the President said in his message to Congress: "The fundamental principles of the anti-trust laws should be more adequately applied. Monopolies and private price fixing within industries must not be allowed or condoned. 'No monopoly should be private.'" In the same breath the President said: "We must continue to recognize that incorrigible minorities within an industry, or in the whole field of trade and industry, should not be allowed to write the rules of unfair play and compel all others to compete upon their low level."

Any man in business knows that the one crime of "incorrigible minorities" is price-cutting in some form. Practically all the code rules designed to insure *fair* competition are specifically aimed at various devious ways of price-cutting, and at that only. When these various devious ways of price-cutting are eliminated, the prices of all basic commodities, such as the rock products, are bound to become very nearly uniform, at least in restricted localities where costs of labor, fuel, power, etc., are uniform. This *is private price-fixing,* if that term means what it should—price fixing based on cost, made privately by each individual producer. He makes public this price, under the codes, and any one who can produce within that cost-price is certainly not going to quote higher; and those whose costs are higher are going to go broke trying to meet this established price.

The difficulty, of course, comes from the possibility or probability that a low-cost producer will not quote his lowest possible price, because he wishes to protect some of his higher cost competitors. In a great many instances this is good business policy and good public policy, for him to protect his competitors within reasonable limits, of

course. For in any industry producing a staple commodity, while the cost elements of labor, power, fuel, etc., are practically the same for all competitors, the biggest item of unit cost is *volume*, and this necessarily varies greatly not only as between different producers, but with the same producer at different times. Because a producer happens to have a large volume with consequent very low costs he would be foolish to take all the business in sight at the lowest possible prices, as he might do, because the conditions would be sure to be reversed in time, and with a less volume of business he could not begin to meet the low price he himself had established. To do otherwise than make a price fair to his competitors merely would be to take a ruinous risk as a result of his temporary advantage, which certainly would not be in the interests of himself, of his employes, and of his stockholders, and in the last analysis, not in the public interest.

If the government really wants the lowest possible prices, it should permit *collusion*, and *allocation* of production. Then the utmost economy in prime costs would be possible by concentrating production in one or more of the plants—with maintenance expenses allowed the idle ones. But this would be a low price at the expense of the idle plants' employes. Public interest requires that this be taken into consideration. Public interest requires that the idle plants be maintained against the day when they will be required, or as insurance against a real monopoly.

Until government is able to see some of these things, we shall continue to hear such vague attacks on price-fixing and alleged monopolies simply because prices of basic commodities are standardized. Of course, those of us who know anything about the business of these industries know that prices must be standardized if we are to avoid the very evils the NIRA was primarily designed to eliminate. The only question the government or any purchaser has a right to inquire into is: "Are these prices fair, all factors taken into consideration?" To be able to answer that in any specific case is industry's problem. Under present conditions it involves how much profit should there be if no one producer is so greedy that he wants it all?—and in these days profit should be based on percentage of sales and not on investment, because idle money is less important at the moment than idle men. Should there be any profit at all, until our ship of state is on a less stormy sea?

Rock Products News Briefs

Sand and Gravel

Nevada: A motor-driven gravel plant was recently completed in the shops of Dodge Construction, Inc., at Fallon, and is being installed for the highway contract along the main route at Coaldale. The principal feature of the plant is elimination of all long belts, exposed gears and shafts by use of motors and covering machinery parts offering hazards to workmen.

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Fort Peck Dam: The J. L. Shiely plant at Cole, Mont., was recently undergoing extensive improvements and enlarging in connection with its gravel contract for the Fort Peck Dam. The large electric-shovel, considerable amount of narrow-gauge track and considerable machinery were moved to Cole from the Chinook gravel plant. Two new cement storage bins are to be built, and a conveyor is to be operated from the pit to the screening and washing plant.

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Cement Products

Prairie Concrete Products, Prairie du Chien, Wis., recently announced that operations would be resumed as the result of action taken by stockholders of the company at their annual meeting in January. The company manufactures cement products, principally silo staves, cement blocks and brick. During the last two years the plant has been closed, but the present demands, according to officials, warrant resuming operations.

Lime

Washington Building Lime Co., Baltimore, Md., is to begin work immediately on a branch plant at the Gray Knox Marble Co., Knoxville, Tenn., according to a recent announcement of officials. In this plant it will utilize the waste product of the marble company in the manufacture of chemical lime, and will operate with a capacity of two carloads a day.

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New Paris, Ohio: The limestone quarries and lime kilns, which were closed a number of years ago after 60 years of successful operation, were the most flourishing industry in this area. There is little remaining to show the extent of the operations, the excavations north of New Paris being filled with trash, while the abandoned excavations and kilns can be seen south of the town. During busy times 100 to 150 men were employed and various allied industries benefited through its busy season, and it is said that up to 1800 cords of wood were used annually in the kilns.

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Quarries

Gottron Bros. Co., Fremont, Ohio, on Jan. 31, was awarded the contract to furnish stone for city purposes during the year. The bid, the only one submitted, was for eight grades of stone, ranging in price from 90c to $1.10 per ton. The contract calls for a 50c addition per ton for each case for delivery, and a discount of 5c per ton if payment is made within 10 days. The city is to get the benefit of any reduction, if lower prices are filed with the code authority during the year.

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Quartzite Stone Co., Lincoln, Kan., was to begin work January 21 on a 3700-ton rock order which will be stock-piled along U. S.-40S to be used in paving there in the spring. T. R. Carlgren, manager of the plant, said that several other jobs are in view. The company will furnish 4000 tons of filter rock for a sewage disposal plant to be built at Hays, Kan., in the spring and was low bidder to furnish 4500 tons of rock for the viaduct at Concordia.

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The stone quarry of the bankrupt Carolina Crushed Stone Co., Charlotte, N. C., was sold, January 29, to an unnamed client for $19,500. The quarry has been operated by W. F. Scholl as trustee. The sale will close out the affairs of the bankruptcy with enough money to care for all obligations and pay a dividend.

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Northwest Magnesite Co., Chewelah, Wash., had 100 persons marooned by snow at its quarry site, six miles from town in January. Twenty-five families, who live at the quarry and fifty "commuters," were marooned. The company had set up emergency quarters, and was furnishing a wagon-load of food daily over an aerial tramway. A state highway department rotary plow was to be used in an effort to reach them.

Combustion Economy in the Rotary Kiln*

Part 5—Combustion of Fuel Oil

By Robert S. Schultz, Jr.,

Consulting Engineer, Maplewood, N. J.

THE FIRST REQUIREMENT for the ideal combustion of pulverized coal is, as stated in the previous article, that "the coal must be reduced to infinite fineness." Fuel oils, even heavy residue oils, because of their liquid state at firing temperatures and because of methods available for atomization, approach this ideal state more nearly than is commercially possible with pulverized coal.

The elemental chemical composition of fuel oils is similar to that of all commercial fuels—carbon and hydrogen with minor percentages of sulphur, oxygen and nitrogen—and combustion calculations must be based on this elemental analysis. But, fuel oils consist predominantly of hydrocarbons which vaporize and become gaseous at relatively low temperatures and make the practical combustion problems in the rotary kiln similar to those for the volatile matter in bituminous coal. The combustion of fixed carbon, even with the heavy residues, is of minor importance, and, because of small percentages and high temperatures, can be considered as part of the gaseous combustion.

The combustion of fuel oil in the rotary cement kiln can be divided, therefore, into two stages which are similar to the first two stages of the combustion of pulverized coal:

(1) The fuel oil must be atomized, heated to the vaporization temperature and vaporized.

(2) The "gaseous hydrocarbons" must be contacted with sufficient oxygen and burned.

The First Stage

The high gravity fuel oils and residues generally used in cement practice require heating to decrease their viscosity and to permit proper atomization by the burner. The minimum degree of this preheat will depend on the viscosity of the oil and on the type of burner in use. However, the maximum practical degree of preheat, rather than the minimum, should govern this important factor. The advantages to be gained from preheating the fuel have been outlined in previous articles. For fuel oils, maximum preheat is particularly desirable not only for its influence on flame temperature, but because it decreases viscosity, improves atomization and speeds up the combustion process.

The function of a burner in a fuel oil system is to atomize the oil to prepare it for vaporization and for intimate mixing with the air for combustion. For rotary kiln service, burners should furnish the maximum degree of atomization possible with the particular oil at the particular degree of preheat; should permit accurate, rapid and minute regulation and should be designed for continuous operation at high rates. Burners should be simple in design, difficult to clog, easy to clean, low in maintenance cost and preferably low in first cost.

For purposes of classification, oil burners may be divided into several types:

Spray type burners.
Mechanical type burners.
Vapor type burners.

Spray type burners employ an atomizing agent, usually steam or air, under either high or low pressure, to divide the oil into a fine spray which may be either flat or conical depending on the design of the burner. This type of burner may be either inside or outside mixing. With the inside type, the atomizing agent and the oil are mixed in a chamber in the burner and then pass through a nozzle in a fine spray due largely to the expansion of the steam or air used for atomizing. Fairly high pressures are necessary for the efficient operation of this type of burner. With the outside mixing type of burner, the oil, usually under low pressure, is atomized by a stream of the atomizing agent, usually under fairly high pressure, flowing across it.

Mechanical type burners are either rotary burners or pressure burners. In the rotary burner, the oil drops on to a rapidly rotating disc or cone or shaft and is atomized on being thrown off by centrifugal force into a blast of air from a blower. In the pressure burner, the oil is under high pressure (usually between 100 and 300 lb. per sq. in.) and is atomized by passing tangentially through small orifices into a stream of air.

In the vapor type burner, the oil is vaporized (not atomized) by and into a stream of preheated air. The oil having been converted into a gas is handled and burned like a gas. This type of burner has been limited to small installations, particularly where ample waste heat is available. So far as is known, it has never been tried in rotary kiln practice.

In the cement industry, spray type burners are in almost exclusive use. This is due partially to low first cost but more particularly to the adaptability of this type of burner to the needs of the rotary kiln, and to the type of combustion in general use. The efficiency of its use is questionable.

The use of air for atomizing, especially low pressure-large volume air, is of considerable advantage since it makes an intimate and highly combustible mixture, rather than a mixture of the oil particles with inert water vapor. Low oil pressure is also desirable since it permits simple and accurate regulation of the quantity of oil being fed to the burner.

The action of oil in the heating stage of combustion is similar to that of pulverized coal. On admission to the kiln, the oil, atomized into globules which are small to a measurable scale but large to a molecular scale, absorbs heat rapidly and begins to give off volatile gases which diffuse into the surrounding atmosphere and continue to absorb heat to the ignition temperature. This action is extremely rapid and the volume of combustible vapor large. Initial combustion is even more violent than with pulverized coal.

The Second Stage

In fuel oils, all of the combustible is in the form of volatile matter so that the second stage of combustion is also the final stage. All of the problems of actual combustion are concentrated in the single stage.

As in the combustion of the volatile matter in pulverized coal, the real problem in the combustion of fuel oil is to contact the combustible with oxygen and, due to the concentration of combustible, the problem is a serious one. The gaseous hydrocarbons from the vaporized fuel oil burn instantaneously, if contacted with sufficient oxygen for complete combustion, in a short quick flame of high temperature. But if sufficient oxygen is not contacted, these hydrocarbons break down or "crack" into more staple gases of combustion, such as carbon monoxide and hydrogen, and soot and a long, smoky flame of much lower flame temperature results. At burning zone temperatures, these reactions are extremely rapid and if "cracking" is to be prevented the fuel must be intimately mixed with air and agitation must be violent. It has been estimated (reference No. 22)† that only 0.036 sec. is required for the complete decomposition of heavy hydrocarbons at a temperature of 2732 deg. F. (1500 deg. C.) and that at 3300 deg. F. (1800 deg. C.) even this time is considerably decreased. The need for intimate mixing and violent agitation is evident, if a long, smoky flame is to be prevented. Natural diffusion alone cannot prevent "cracking."

When "cracking" of the hydrocarbons is not prevented soot is formed. This soot burns slowly, much as the fixed carbon of pulverized coal, and introduces a third stage

*Part 1 was published in Rock Products for July, 1934, pages 38 and 39; Part 2, September, 1934, pages 36 and 37; Part 3, November, 1934, pages 24 and 25; Part 4, January, 1935, pages 18-21.

†All references will be summarized in concluding article.

TABLE 3—ANALYSES OF REPRESENTATIVE FUEL OILS

Source of Oil	Stock	Gravity at 60 deg. F. Sp. Gr.	Gravity at 60 deg. F. Degrees A.P.I.	Flash point deg. F.	Burning point deg. F.	Pour point deg. F.	Saybolt furol viscosity Sec.	Saybolt furol viscosity deg. F.	Ultimate analysis, % by weight—Carbon	Hydrogen	Sulphur	Oxygen, Nitrogen & Miscl.	Heat value B.t.u. per lb. Gross	Heat value B.t.u. per lb. Net	Combustion, Lbs. Air per Lb. Oil	Theoretical flame temperature deg. F.
California	Fuel	0.9645	15.3	226	226	..	67	68	86.36	11.27	0.89	1.48	18853	17782	13.89	4210
California	Fuel	0.9421	18.7	...	...	43	..	..	85.65	11.40	1.60	1.35	18607	17522	13.91	4150
California .....Residuum		0.9909	11.3	...	...	50	..	..	86.80	10.04	1.49	1.67	18088	17128	13.44	4190
California	Crude	0.9700	14.5	192	235	..	40	68	85.64	11.37	1.06	1.93	18473	17399	13.86	4140
Oklahoma	Fuel	0.9024	25.3	...	...	32	60	77	86.40	12.38	0.46	0.76	19353	18173	14.27	4190
Oklahoma	Crude	0.9030	25.2	264	286	..	92	68	87.93	11.37	0.29	0.41	19650	18571	14.09	4310
Oklahoma .....Residuum		0.8705	14.3	...	...	17.8°C.	57	77	87.65	10.27	0.70	1.38	18454	17479	14.03	4105
Texas	Crude	0.9200	22.2	142	181	..	..	..	84.60	10.90	1.63	2.87	19060	18023	13.56	4355
Texas	Fuel	0.9260	21.4	216	240	..	..	..	83.26	12.41	0.50	3.83	19481	18300	13.86	4320
Texas	Fuel	0.9070	21.6	222	...	..	..	..	85.0	12.3	1.70	1.0	19230	18059	14.13	4195
Mid-Continental.	Fuel	0.8920	27.0	125	...	..	..	..	85.6	12.0	0.30	2.1	19376	18234	14.03	4260
Kansas-mixed ..	Fuel	0.9013	25.5	...	...	38	23	77	86.50	12.38	0.46	0.76	19182	18002	14.28	4155
Kansas-mixed ..	Fuel	0.9036	25.1	...	...	38	16	122	86.20	12.39	0.39	1.02	19256	18076	14.24	4180
Kansas .....Residuum		0.9218	22.0	...	...	17.8°C.	14	77	87.40	11.10	0.42	1.08	18778	17723	13.93	4180
Kansas .....Residuum		1.0030	9.2	...	...	42	159	122	88.40	9.92	0.68	1.21	18274	17324	13.65	4180
Kentucky	Fuel	0.9076	24.4	...	...	52	151	77	87.10	12.53	0.22	0.15	19358	18168	14.43	4140
Mexico	Crude	0.9860	12.1	120	...	..	..	..	83.7	10.2	4.1	4.2	18720	17750	14.30	4095
Mexico	Fuel	0.9870	11.9	...	...	..	..	..	84.02	10.06	0.99	4.93	18510	17554	14.14	4090

Analyses from reference No. 71 and various sources. Net heat values based on 1057 B.t.u. latent heat.
Flame temperatures not corrected for dissociation.

to the combustion of fuel oil. Except to a very small extent, this third stage is avoidable. Its presence indicates imperfect mixing and inefficient combustion.

Efficient combustion of fuel oil depends on rapid and complete contacting of the combustible with oxygen. The time required for combustion depends on the rate of contacting.

In calculations involving heat available from the combustion of fuel oil it is necessary to use the "net" or low heat value. Fuel oils have a high hydrogen content and the vaporization of the resultant water vapor necessitates the absorption of a considerable portion of the total available heat. This loss amounts to between 5% and 6% with the high gravity fuel oils in use in the cement industry. The "net" heat value is of particular importance in theoretical flame temperature calculations.

(*To be continued.*)

Code Developments

THE PRESIDENT issued an executive order to all code industries, toward the end of the year, that does not seem to have been very well circulated, although it would seem to be a very important one to all those producers in the rock products industries who are attempting to get by without adequate maintenance and renewals of worn-out equipment. It is this:

ADMINISTRATIVE ORDER NO. X-124

Interpretation: Effect of temporary interruptions in work beyond control of employe as affecting maximum hours and computation of wages under various codes.

Facts: Complaints have been received concerning practices of certain employers, subject to various codes, whereby the employer requires his employe to take time out without pay during the course of a work day for periods of inactivity due to break-downs, delays, time spent waiting for materials or waiting for the loading or unloading of railroad cars or other vehicles of transportation, and interruptions in activity due to other causes.

Question: Under the maximum hour and minimum wage provisions in codes, may an employer properly require an employe to take time out for such interruptions and not compute such time in determining maximum hours of labor and the wages of such employe?

Interpretation: Time during which an employe is inactive by reason of interruptions in his work beyond his control may not be construed as time not worked, nor excluded in computing his hours of labor and wages. The term "interruptions" includes, but without limitation, the specific instances hereinabove set forth under "Facts" whenever the imminence of resumption of work requires the employe's presence at the place of employment. Such requirement is to be presumed in the absence of adequate prior notice from the employer that the employe is free to leave his place of employment if he desires. An employer may not, however, by notifying an employe that he is free to leave for an interval too brief reasonably to be considered a temporary lay-off, thus avoid computing such period as time worked. Nothing herein contained, however, shall be construed to modify or affect in any way bona fide, voluntary and mutual agreements concerning the subject matter hereof, arrived at by employers and employes, when the same are not in conflict with the maximum hour and minimum wage provisions of the code applicable to such parties.

Code Costs to Industry

Some anti-administration newspapers, apparently, have been grossly exaggerating the tax on American industry and business to maintain their code activities. The NRA has figured the actual cost of administering all the codes is $41,400,000, with an average assessment of not more than 10/65ths of 1% of the volume of sales. Here is the analysis:

53 budgets under 1/10th of 1% of sales
109 budgets 1/10th to ¼ of 1% of sales
51 budgets ½ to ¾ of 1% of sales
19 budgets ¾ to 1% of sales
14 budgets 1% or over of sales

Price and Labor Policy Hearings

Part of the material congress will have available in enacting a new NIRA, or extending the present law with modifications, is the voluminous proceedings of the public hearings in January on price and labor policies.

At the price policy hearings a majority of the spokesmen for industry told the Board that business wants some form of price regulation, although they differed as to method. Almost no one wanted rigid, permanent "fixing" of prices at arbitrary levels.

Some of the speakers thought a requirement for open filing of prices would provide adequate control; others said provisions for the declaration of minimum prices during limited emergencies have worked well in those industries where they have been tried. A number of witnesses urged limiting control to a prohibition of sales below cost, the average cost for an entire industry or, in some instances, the cost of the individual. Production control was also cited as an effective measure of price control in certain industries. Another opinion advanced was that Code provisions for minimum wages and maximum hours were sufficient because they would limit or eliminate price cutting at the expense of labor.

Both Norman G. Hough, president of the National Lime Association, and Otho M. Graves, chairman of the Code Authority of the Crushed Stone, Sand and Gravel, and Slag Industries, submitted briefs defending the open-price provisions of their code.

At the hearings on labor policy, discussion concerned chiefly the demand of the American Federation of Labor for a 30-hour week. This was strenuously opposed by all industry representatives.

Non-Waiver of Constitutional Rights in Signing Codes

On February 4, the President by an execu-

tive order assured business and industry:

(1) It is understood that neither the Government nor any member of industry waives, or can properly insist that the other has waived, any constitutional right pertaining to the Government or to any individual by approving, assenting to, or co-operating under a Code of Fair Competition.

(2) The approval orders of all such codes heretofore approved are hereby modified to the extent necessary to make this Order a condition thereof, and this Order shall operate as a condition of the approval of any such code hereafter approved.

Lawyers Report on Codes

The Trade and Commerce Bar Association, through its committee on compliance and enforcement, in a study on compliance and enforcement under NRA, states that all regulations in codes found unfair and unenforceable should be deleted. The committee declared it hazardous to try to regulate those things which cannot be controlled. It advocated simplification of trade practices, and greater co-ordination and uniformity among the provisions of different codes.

Industries to Adjust Own Labor Difficulties

President Roosevelt on January 22 ordered the National Labor Relations Board, which failed so signally in the automotive industries case, to refrain from injecting itself into labor disputes in industries which have code provisions for their own labor boards of jurisdiction.

Cement Industry

The NIRB has approved the following members of the Code Authority for the cement industry: G. E. Warren, Southwestern Portland Cement Co., Osborn, Ohio; F. M. Coogan, Alpha Portland Cement Co., Easton, Penn.; E. P. Lucas, Superior Portland Cement, Inc., Seattle, Wash.; J. F. Neylan, International Cement Corp., New York City; L. T. Sunderland, Ash Grove Lime & Portland Cement Co., Kansas City, Mo.; S. W. Storey, Trinity Portland Cement Co., Chicago, and G. H. Reiter, of Chicago.

Crushed Stone, Sand and Gravel and Slag Industries

NIRB has approved budgets, for December 1, 1933, to December 31, 1934, in the amount of $189,500 for expense of administering Code by Code Authority, and $646,600.91 for expense of administering Code by regional, state, district, and division committees; assessment, 5 cents per 1000 tons per month for tonnage produced in calendar year 1932. The Executive Council of the Code Authority has submitted for approval a budget of $197,915.01 for administering the code from January 1 to March 31, 1935.

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NIRA has approved plans for the organization of agencies and procedure for handling trade practice complaints in District 2 of Region 2 (Albany, N. Y.), and for Region 4.

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NIRB has issued order 109-65 granting exemption to the St. Joseph Lead Co., 250 Park Avenue, New York City, from the hour, wage, and labor provisions, articles III, IV, and V, of the Code, provided the comparable provisions of the Code for the lead industry shall be followed in all operations where this exemption applies. The order also grants exemption from the cost accounting provisions, article VII, section 2, and from the provisions having to do with stabilization of production, article VII, section 5. The order denies the application of this company for exemption from the payment of assessments, article VI, section 5, subsections (*a*)-2 of the Code.

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NIRB has issued order 109-72 denying application of Virginia Glass Sand Co., Winchester, Va., for exemption of its plant near Gore, Va., from the provisions of articles III and IV of the Code. Order 74 denied application of L. K. Brown, Zanesville, Ohio, for Liberty Molding Sand plant located near Newark, Licking County, Ohio, for exemption from the provisions of article IV, secton 1, of the Code.

Regional Elections

Producers in Region II re-elected J. L. Shiely, of St. Paul, chairman of the regional committee. Other members selected to the committee include M. D. Butler, Grand Forks; Mary Nierling, Jamestown, N. D.; Lee Coman, Fargo; Fred S. Johnson, Summit, S. D.; C. A. Wagner, Sioux Falls, S. D.; W. E. Bartholow, Huron S. D.; Palmer Ulland, Austin; G. A. Roverud, Spring Grove, Minn.; T. R. Coughlan, Mankato; F. G. Wood, Duluth; A. A. McCree, St. Paul; L. E. Luth, Winona, and S. E. Berg, Minneapolis. State committees include: Minnesota: A. A. McCree, St. Paul; P. C. Roth, Brainerd; E. H. Maag, Cosmos; G. H. Young, Minneapolis; E. W. Hallet, Crosby; A. R. Shiely, St. Paul; North Dakota: C. E. Wood, Minot; J. H. Newton, Mandan; Thomas Berge, Williston; Mary Nierling, Jamestown; Lee Coman, Fargo; M. D. Butler, Grand Forks; Ralph Norman, Bismarck; South Dakota: C. A. Wagner, Sioux Falls; Delbert Wheeler, Sioux Falls; S. W. Jonason, Aberdeen; W. E. Bartholow, Huron; E. W. Meeker, Rapid City; Martin Joyce, Brandon; W. T. Doyle, Sioux Falls.

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About 100 producers of Region 2 met in Syracuse, N. Y., recently and named H. E. Rainer, Carroll Weston and Harris N. Snyder, of Buffalo, members of the regional code authority for the slag industry. The following were elected as representatives of the crushed stone industry: Otho M. Graves, J. R. Callahan, Albany; J. E. Cushing, Schenectady; J. L. Heinlich, Leroy; C. A. Powers, Herkimer; James Savage, Buffalo; J. H. Dahn, West Nyack, and A. E. McCoy, Rochester. The sand and gravel producers named the following code representatives: John E. Redmond, Rochester; Kenneth J. Premo, Massena; George R. Krom, Newburgh; E. M. Hammond, Buffalo; C. W. Maxwell, Albany; L. B. Gray, Utica, and Jacob J. Goodstein and Anderson Dana, New York City.

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Producers in Region 16 elected Porter W. Yett, Portland, Ore., chairman of the regional code authority; Fred Redmon, Yakima, Wash., vice-chairman; John Reese of Portland, secretary-treasurer. Other members of the committee are Geo. W. Gauntlett, Seattle, Wash.; George Jacoby, Helena, Mont.; L. D. Robbins and Roy H. Shoemaker, Boise, Idaho; Marshall Newport and Raymond D. Hoyt, Portland, and Dr. Walter A. Moore, Seattle. It was voted to maintain the regional offices in Portland for the coming year.

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About 100 producers in Region 8 met and re-elected Russell Rarey, Columbus, Ohio, chairman of the regional code authority. Other officers re-elected were: Wm. Edward Hole, Greenville; W. E. Bliss, Youngstown, and H. M. Sharp, Toledo, vice-chairmen; Stephen Stepanian, Columbus, treasurer, and Claude L. Clark, executive secretary.

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NIRA has approved regional adjustment agencies as follows:

REGION 2, District 6, F. X. Ernst, chairman, J. J. Pendergast, A. J. Hooker, G. S. Snyder, and P. J. Kremer, all of Buffalo, N. Y.; and G. R. Broderick, Niagara Falls, N. Y.

REGION 2, District 5, A. E. McCoy, Harvey N. Clark, Homer W. Storey, and John E. Redman, all of Rochester, N. Y.; and E. J. Nunan, Buffalo, N. Y.

REGION 3, I. Wortman, Morristown, N. J.; H. H. Wagner, Lebanon, Penn.; Robert Lacy, Baltimore, Md.; H. W. Peterson, Paulsboro, N. J.; J. M. Whittock, Highspire, Penn.; George J. Frye, Philadelphia, Penn.; and Carroll D. Winters, Wernersville, Penn.

REGION 11, J. L. Shiely, St. Paul, Minn., W. W. Gibson, Minneapolis, Minn.

Slate Industry

Code Authority has applied for approval of a $10,400 budget for the period February 1, 1935, to February 1, 1936. Each of the industry's four regions would contribute to the budget in the ratio of regional sales to national sales, as reported by the United State Bureau of Mines. Under this plan, the regions would share the budget as follows: Maine, $904.80; Vermont-New York, $2,662.40; Pennsylvania-Maryland, $6,136; Virginia, $696.80. Members within a region would contribute in the ratio of their sales to total sales in the region.

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NIRB has issued order 218-15 terminating the exemption conferred in paragraph (*a*) exemption conferred in paragraph (*a*) of Administration Order X-48, dated June 12, 1934, insofar as such exemption may apply to prices and/or discounts published for sales to other members, distributors, or dealers.

Gypsum's Role in the Movies

Hollywood "Casts" Hardwall and Casting Plaster in Star Parts

By A. B. Laing,

Hollywood, Calif.

A WELL-KNOWN ARTIST has just completed several score full size statues in plaster staff for an excellent movie (Night Life of the Gods). In another Hollywood episode, soon to be shown on the screen, all the traffic of a modern street (trams, autos, and pedestrians) will be reproduced life size in staff, while on over three hundred sets, now before the cameras, hardwall plaster is soon to be seen in leading roles.

This spurt in the use of gypsum products in the movies has come about with recent refinements in lens, film emulsion, lighting, and the more selective microphones for recording apparatus. Due to these improvements in cinematography, America's fifth largest industry has become one of the largest single customers of gypsum products.

Exclusive of routine purchases of cement and plaster for the maintenance and extension of the lot, a major Hollywood studio will now consume over 1000 tons of hardwall and close to 10,000 sacks of casting plaster, per annum, in the manufacture of sets and props.

In addition, many of the approved nationally-advertised plaster bases, patent lath and gypsum board are now bought in carload quantities—largely because of their acoustical advantages. They conquer echoes, and help reduce microphone reverberation—an ever-present production problem.

Each picture requires from 15 to 100 sets. A set may be the few plaster yards represented in a doorway, or a structure the size of the Coliseum at Rome.

These figures convey some idea of the plaster work which goes on backstage, when it is realized that most major studios have from 2 to 10 pictures in simultaneous production, each requiring about 10 weeks to complete.

It has been found desirable in most cases to fabricate these filmic structures in the studio rather than transport expensive companies to distant locations. This is partly because studio overhead, or "nut" as they call it, is reckoned at between $2000 and $2500 per hour. Moreover, the big stucco sound stages (each approximately 150x350x 90 ft.) are all air conditioned, hence the desired weather is always available and lighting can be accurately controlled. Call it faking, theatrical license—anything you like—the result has been better and cheaper pictures.

A studio like Fox, Paramount, or M-G-M, will employ approximately 100 master plasterers at all times. (There are no "helpers" in movieland.) "Mud" is mixed mechanically, and conveyed to the job by means of an overhead monorail which, at Paramount, connects all 26 acres of the lot. Arriving at the door of the designated stage it is switched, by manually operated switches, over the 700 ft. of inside rail to any point in the building. The carriers thus dump direct to the mortar boards. Mechanics draw the "scale" or batter, but must be capable of rodding true, and carrying out the intricate groining and moulds which may at any time be called for on the art department's blueprints. A workmanlike job is imperative, since the camera's all-seeing eye finds every fault and projects it on the theatre screen *several times magnified.*

An example of how perfected screen technique makes possible greater realism, is seen in another current picture, "All the King's Horses." The script called for a couple of acres of flagstoned courtyard for a medieval building. Construction crews laid these stones in heavy cement mortar directly over the wood floor of the sound stage, and hoofbeats came in convincingly, naturally.

But sets are of course not confined to building façades and interiors. A large stretch of plastered desert was recently constructed for the movie, "Clive of India." Wood frames were bandsawn at the studio mill in simulation of the roll of sand dunes. Over them, when assembled, was stretched burlap. Two coats of plaster were applied in the usual manner. After which, the finish coat was trowelled in, with an admixture of mineral color. Photographically, the illusion is perfect.

For another illustration of how the ingenious movie technicians have conscripted plaster to assist them in the fight for better pictures at less cost, look at Laemmle's Universal Studio. Here Danny Hall, in charge of construction, has erected over 15 acres of permanent plastered sets—ancient villages, including a full size front elevation of the cathedral of Notre Dame, and the replicas of many other historic monuments. He has taken a natural cliff and treated it with

Editor's Note

THIS ARTICLE should be of special interest to gypsum products manufacturers not so much on account of the "movie" element as because it shows uses for gypsum which may have a much wider application. World's fairs and many lesser kinds of exhibits are held at various points throughout the country, and the possibilities of the spectacular in the use of gypsum for such temporary structures are much wider than its use in the movies. The Century of Progress Exhibition in Chicago, 1933-34, required large quantities of gypsum products—particularly in the replicas of foreign villages. These were so popular a feature that enterprising showmen are likely to put up similar structures in other cities, whenever an opportunity offers.

—The Editor.

Hollywood calls on gypsum to portray traffic of a modern street

plaster, in colors, to represent a snow-covered mountainside, for shooting far north scenes.

Cast symbolic friezes, figures, images, all help the director put across the desired mood or "key" of each scene—sets, you see, are expected to play a part in the telling of the screen story. "If a setting is to be thrown on the screen empty of human beings, it must be so designed as to give an indication of the kind of action subsequently to take place," so asserts Hans Dreier, the gifted art director at Paramount.

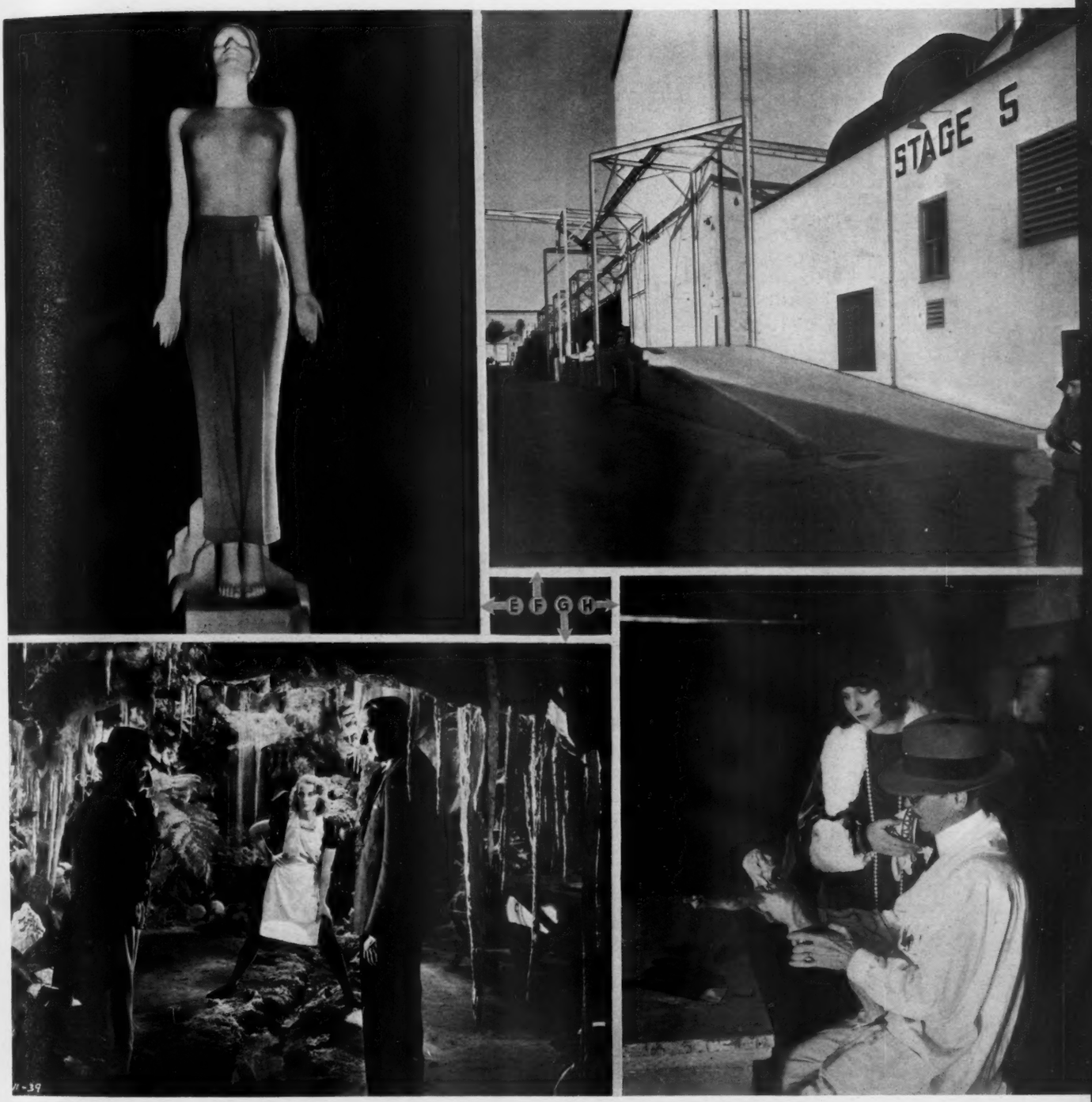
An example of plaster's role in this respect is seen in the heavy overmantel which is the focal point of the room in which Miss Landi and Cary Grant enact a lyric love scene in "Enter Madame." Here the massive design with cupid ornamentation assists the audience to grasp the significance of the episode at a glance. "This is no love in a cottage," you say to yourself, "but the grand passion in the grand manner!"

The weird, tragic-atmosphere background of the Russian revolution was heightened by hundreds of fantastic gypsum gargoyles on the Kremlin walls. Violent drama, humor, pathos and comedy, likewise are interpreted in plaster.

A Hollywood plaster shop employs about 10 experienced men, many of whom are renowned artists. The number is swollen to 30 or 40 when important pictures are in production. Some of the recent work of these craftsmen is illustrated herewith. One recent piece of which they are justly proud, is a huge temple bell, weighing two tons, beautifully calibrated, 15 feet in diameter—cast completely in plaster.

When not engaged in rush orders on contemporary pictures, the force is kept busy maintaining the shelf stock of friezes, caps, pilasters, pedestals, vases, panels, stair rails and banisters, etc., that are constantly called for.

A—Massive staff decoration in the film "Cleopatra." When set, plaster takes lacquer and other highlighting—necessary for effective photographic composition. The props on Cleopatra's royal barge are intended to convey to the senses the majesty of ancient Egypt. B—Overmantel of symbolic figurines establishes the mood of the scene, helping Elissa Landi and Cary Grant get the "feel" of their roles before stepping into character, in the film "Enter Madame." C—Plaster shop. All plaster and marble work used in Paramount pictures made on the West Coast is done here. F. W. Potter, head of the department, is shown in the picture. D—"Epaulières" of cast plaster on the shoulders of the gladiator enacting a scene with Elissa Landi



E—Cast of a statue of Marlene Dietrich made by the eminent sculptor Scarpitta. The trousers were added by a studio wag —not by the censor. F—Stages 6, 7 and 10 as well as stage 5, shown here, face this street at the Paramount studios. Wynne Gibson is in the foreground. A portion of the overhead monorail system is seen. This carrier saves over 40% in material handling costs, says Frank Brandon, studio manager. G—Stalagmites and stalactites of this cave are formed in plaster. Ferdinand Gottschalk, Florine McKinney and Alan Mowbray appear in this scene from the Universal picture "Night Life of the Gods." H—A corner of the statuary department of Paramount studios

But the extraordinary versatility of gypsum products as ornamental and decorative mediums, in the new filmcraft, is perhaps more clearly apparent in their use as "props," e. g., the full size statue of Marlene Dietrich. Many casts had to be made, since the story called for it to be destroyed. Thus many had to be broken in rehearsals until a perfect "take" was achieved.

The old days of movie extravagance are dead. No longer does a director order—say, a lifesized whale, with the words: "Maybe you'd better form him in wood." Or requisition an archbishop's mitre in cloth-of-gold. Nowadays a conference is held before a dime is spent for such necessities. A committee of experts decides what is the cheapest and most realistic material to be specified. "And that," as one studio manager reports, "has resulted in a saving of approximately 35% in set and prop costs"—and given sypsum plaster its big chance.

Such information as is contained in this brief article was obtained from studio officials reluctant to divulge it, fearing that it might tend to dissipate the showman's chief asset—*audience illusion*. But the readers of this magazine will find their enjoyment of the show in no way lessened by the privilege of this peep backstage; intensified, rather.

Modern Prospecting for Rock Product Minerals

By Frederic C. Gill,
Glade Spring, Va.

IN a development of a raw product from the earth, one of the most important considerations is a preliminary prospecting by which the exact position, extent, thickness and value of a deposit is ascertained. This is true if the product be a metallic or non-metallic mineral, coal, shale for cement making, limestone for lime burning, or even trap rock or other stone for ballast, road making, riprap, etc., where it is proposed to produce the latter on a large scale. The determination of the amount present, its superficial area, its grade, physical and chemical properties, is as important as the other phases of bringing a product from the ground to market—processing and selling profitably. In fact, profits cannot be computed without all the factors—amount of raw product and cost of producing, determination of and cost of processing, and delivery to the consumer. And the first is the most fundamental.

Upon locating an outcrop of mineral or stone of a promising value, the prospector should first determine whether it is a solid ledge or float. If float, the original deposit, or the material in place, must be located. If solid, and the overburden is not too heavy, it should be opened up by trenching on both the strike and dip, samples taken beyond the weathering, and values deduced. Exploring equipment may then be increased to include hand rock drill steel, sledges and dynamite. As soon as the information gained shows a deposit of promise, it is best to proceed along more definite lines to determine the continuity of the material and its grade.

Samples should be secured from different parts of the property and from various depths to ascertain how uniform the materal runs. A number of test shafts, slopes or drifts offer the logical means of securing this information. These offer a large area for sampling and are means of extracting amounts large enough for treatment and sale. However, shafts are extremely costly if carried to any practical depth, or below static water level; and waste material excavated may affect subsequent operations. The time occupied in sinking or driving exploratory adits is also a factor. It presupposes long options. The market value or demand may so change as to invalidate the whole project while such prospecting is being carried out.

Churn and Core Drilling Methods Compared

There remain two modern methods of prospecting a deposit—churn drilling, or percussion drilling, and diamond core drilling. Each has advantages and disadvantages.

Editor's Note

MANY OPERATORS consider prospecting with churn-drill or diamond core drill a measure desirable only when opening up a new deposit. Nothing could be farther from sound planning of any worthwhile, long-time operation. For in several instances producers have been much misled after having built a plant and opened a deposit. It is never too late to know to a certainty what lies ahead of any such operation.

Under the new securities act, and the desirability or necessity of refinancing many rock products corporations, thorough prospecting of the deposits will undoubtedly assume a new and greater importance, for it is inconceivable that under competent financial supervision the operator will be allowed to sell securities, or obtain a government loan, unless he can prove that his fundamental asset, his rock deposit, justifies the risk.

Hence, this article, by a well-known expert, dealing with the fundamentals of such prospecting, should be of considerable current interest and value to all forward-looking operators, and not merely to those having in mind the opening up of new deposits.

—THE EDITOR.

The Churn Drill

The churn drill is the cheapest per unit of work, provided:

(1) The strata are practically horizontal and regular.

(2) The hole can be carried to desired depth without casing and reducing on account of caving, water courses, caverns, or unconsolidated ground.

(3) Drilling sites are easily accessible.

(4) Material is in massive form and of considerable thickness.

(5) Values are not confined to narrow limits or affected by color or stratification.

(6) Close qualitative sampling is unnecessary.

The primary cost of a churn drill outfit capable of making hole to a given depth is less, as a rule, than a diamond drill of similar capacity. The hourly cost of the operating crew is generally less because less skill is required and consequently less wages are paid. Material expended, depreciation and repairs will be less on the diamond drill than on the churn drill. Fuel costs do not materially differ.

It must be borne in mind that a churn drill hole cannot be drilled reasonably in steeply inclined strata, if at all, especially where soft beds are interbedded with hard. If casing has to be inserted and the hole reduced because of unconsolidated strata, caving, excess of water or tendency to deflect, the cost may be doubled or trebled. If a water course is struck and the hole is partially filled, drilling practically ceases as the water cushions the blow of the tools. Operation is also often slowed up and footage cost increased in soft shales which are difficult to "mix." Progress in very hard rocks is slow.

A churn drill is top heavy and cumbersome to move over rough ground. Where sites are located in mountainous regions or along precipitous hillsides, graded roads must be built. Greater mobility is secured by traction outfits, but it must be remembered the power plant is based on the power necessary for transportation and is generally twice that required in drilling to the outfits' capacity. Thus there is a costly surplus of power while drilling.

Where values are disseminated through a thick stratum, the churn drill sample gives quantitative values which may be satisfactory, especially when checked by a shaft or other opening. However, when values are confined to narrow veins or bands, or exist in irregular masses through a stratum, the exact status cannot be determined by a churn drill sample. Churn drill sampling tends to "salt" itself in mineral testing. The action of the tools and the bailer causes the heavier particles to work to the bottom of the hole, the lighter particles being suspended in the fluid. Mineral particles in argillacious cuttings often are plastered on the walls of the hole. As the bailer never thoroughly cleans the hole, values deduced from the sample are never exact. If the coloring or bedding affects the worth of the material being prospected, as in some marbles, the churn drill is of little value. Minor seams are never detected and the mixed, pulverized mass gives no idea of the color of the rock in place.

The churn drill offers its best qualifications in locating a key stratum or vein well-known or easily identified, and in proving its continuity; in prospecting low-grade deposits of great size and thickness; in placer ground testing; in connection with diamond drills in locating irregular or pockety de-

posits; and in work not connected with the mineral industry, such as water, gas and oil well work.

The diamond drill is not new but its value as an ore, stone or mineral finder and as a means of exploration of known deposits is not fully appreciated or taken advantage of in many instances in which it would unquestionably affect large savings of time, labor and money.

The Diamond Core Drill

Briefly summarized, the advantages of the diamond core drill are:

(1) Not affected by the angle of the strata; holes can be bored at any angle.

(2) Drilling not affected by water in the hole.

(3) Outfits easily taken apart, transported and assembled at sites. No special roads necessary.

(4) Cores readily secured in all consolidated strata and dry or wet samples in the unconsolidated.

(5) Stratification, bedding planes, and color readily determined; and the dip and strike in two or more drill holes.

(6) Cross-checking of sludge and core samples will show results within extremely close limits.

The general tendency is to drill diamond drill holes as nearly as possible across or at right angles to the bedding, or that direction in which the rock breaks most easily. This enables a greater thickness of strata to be tested by a given length of hole, and the cores are more likely to break off nearly square across and thus move freely into the core barrel. In being able to drill at right angles to the dip, depth of holes is saved, and errors are of less importance. An error in thickness in a hole supposed to be at right angles to the formation but really deviating as much as fifteen degrees therefrom is but one-thirtieth. A deflection is not serious under several hundred feet. Diamond-drill holes can be drilled straight and, also, deviation can be controlled. Adequate means for measuring deflection are in use and correct angles of bedding can be calculated where such is desired. Sometimes deflection is forced and more ground at depth is tested without redrilling the upper portion of the hole.

Progress is made by rotating the line of steel tubing reaching from the machine at the surface to the bit at the bottom of the hole and forcing it forward as the formation is cut. A stream of water is continually forced through this line of tools, emerging at the bit and returning to the surface, so that the hole is kept full of water except for the space occupied by the tools themselves. Any water stratum struck has no effect upon the progress, unless it is through discomfort to the operator if the water be artesian.

Diamond drill outfits can be knocked-down into small parcels for transportation by animals or in airplanes if necessary, and reassembling is neither difficult nor costly. Loads can be arranged to suit the conveyance. A large outfit can be transported in ten wagonloads over mere trails. Small, undergrcund outfits can be moved by the operating crew without additional help.

Experienced operators have little difficulty in securing large percentages of core in practically all consolidated formations. In unconsolidated strata wash borings are generally considered adequate, but dry samples can be taken at slightly greater cost.

The cores represent cross-sections of the rock in place. They are continuous samples large enough to be examined in the hand, sectioned for the microscope, or analyzed in the laboratory. They cannot be "salted" except by design. Besides the cores, the sludge, or cuttings, can be preserved and tested in the same way as those from a churn-drill hole, giving thus a double sample. The exact color of the formation as well as the stratification and the bedding planes can be seen in the cores. It is necessary to drill two or more holes to determine the strike and dip unless surface outcrops aid.

One disadvantage of the diamond drill is in the possible loss of cores by grinding in the essential parts of the hole, especially when no return water flow is had and no sludge is obtained. This occurs at times in salt or coal prospecting or in like friable material, or in loosely bedded and disintegrated formations. Modern drilling appliances, however, make this rare and unnecessary.

Adequate drilling of a property, by the proper method, will yield knowledge of the marketable material available as well as the subsurface conditions that contribute substantially to savings in extraction, classification and preparation. Physical and chemical analysis may be made of the cores, and the quality of the material and its adaptability to specific uses revealed. Valuable time is saved in getting a product on the market, and barren lands can be quickly released as well as taxes reduced or entirely eliminated. It supplies the essential and exact knowledge necessary in laying out the primary development program at the minimum of expense, enables permanent plans to be made and costly changes due to a lack of information avoided.

Interpretation and Preservation of Diamond Drill Cores

The interpretation of drill cores and of the various signs they bear need not be a task, but requires some ingenuity and technical ability.

Cores are cylinders of rock descriptive of the formations traversed. They are geological samples and can be utilized in the same manner any other such samples may, no matter how procured. A definite plan for their care and use should early be adopted and vigorously followed. After serving their first use, they should be retained for subsequent checking and analysis, and kept as permanent records.

Drill cores have smooth exteriors, sometimes highly polished, which alter somewhat the real color and appearance of the rock. So, even for preliminary megascopic investigation, cores should be broken and fresh faces observed. Manufacturers offer a special core splitting machine which splits the cores lengthwise. This permits of using half the sample for analytical purposes while the other half may be preserved indefintely. If a hammer is used to break the cores, it will be found difficult to break them longitudinally as the tendency is to break transversely along bedding planes. While a splitter may seem an unnecessary refinement, it is worth its cost where the mineral sought has sufficient value to warrant its purchase, and much drilling is contemplated.

Cores are marked with lines or bands, some of which represent the bedding of sedimentary layers of rock, or the flow lines of lavas. Some indicate slate cleavage or are due to pressure or shearing. The ability of the investigator is called into play in determining which. Proper interpretation of these lines is not always an easy matter as the position of the core cannot well be known. When the core is crossed by bedding lines, and it is known from surface indications or from the faces of drifts or other openings what the direction of the bedding is, it can be determined how the core stood; and with that information the direction of the other lines that cross can be definitely determined. Formulas have been worked out for obtaining the dip and strike of a stratum from the data acquired in three or more drill holes.

If many thousand feet of cores are taken, the space occupied may prove embarrassing. This can be remedied by "cutting" the core. Two or three inches will often suffice to represent ten or more feet of a stratum, especially in country rock. It is well to place a marker in the tray or drawer stating the amount of core destroyed. Often the preservation only of the valuable portion of mineralized section will be satisfactory, but a section of the roof and floor or hanging and footwall should also be included.

Sand-Lime Brick Production and Shipments in January, 1935

THE following data are compiled from reports received direct from producers of sand-lime brick located in various parts of the United States and Canada. The accompanying statistics may be regarded as representative of the industry.

Six active sand-lime brick plants reported for the month of January, this number being two less than the number reporting for the month of December, statistics for which were published in February.

Average Prices for January

Shipping point	Plant price	Delivered
Syracuse, N. Y.	$14.00	$16.00–20.00
Saginaw, Mich.	10.50	.....
Toronto, Ont., Can.	12.00	13.50

Statistics for December and January

	December†	January*
Production	198,886	175,000
Shipments (rail)	32,000	.....
Shipments (truck)	531,395	349,562
Stocks on hand	1,561,211	1,317,019
Unfilled orders	140,000	100,000

†Eight plants reporting; incomplete, four not reporting unfilled orders.

*Six plants reporting; incomplete, three not reporting unfilled orders.

CONSISTENT ADVERTISING CAMPAIGNS

as Applied To *the Selling of Lime*

By Sidney P. Armsby

THE PLANNING and development of effective advertising campaigns for promoting the sale of lime are among the most important problems confronting the industry today. Many producers are perplexed as to what advertising media to employ; how much money to spend; what style of advertising to adopt; which markets need the most attention; who should be made responsible for "copy," how to avoid unprofitable copy; and by a host of other questions, to which answers are urgently needed.

The importance of the problem is emphasized in these days of business readjustment, accompanied as they are by an increasingly keen competition for the favor of the buying public. New requirements have come into existence; higher standards of quality are being demanded; new markets are in the making, and both new and old materials are challenging the ability of the lime industry to serve its rightful markets efficiently and economically. The lime manufacturers must meet this issue squarely, both individually and collectively, if the future of the industry is to be safeguarded. Well planned publicity, along basically sound lines, is one of the most powerful weapons at their command.

How shall advertising campaigns be planned and put into effect? That is a question too big for any one man to answer, and it can be solved only by the combined efforts, experience and knowledge of the entire industry—united and coördinated for the common good of all concerned. I shall only attempt here to add my contribution by calling attention to a few of the facts that should be considered, and by suggesting some of the practical applications of such facts.

Emphasize a Basically Valuable Commodity

The first requirement for any sound advertising program is that there be something deserving of exploitation; something that, when purchased and used, will render a real service. Lime is such a material. The many industrial processes and operations in which lime is essential as a raw material or a necessary ingredient, the others in which it is the most efficient or economical of several possible alternates, the new and useful applications being continually developed for it, all these offer ample proof that lime is one of the most versatile, necessary and generally useful of all our basic materials. The improvements constantly being made in manufacturing methods have gone far, and will go farther, toward raising the quality and increasing the serviceability of lime for all its applications, and lime manufacturers are coming to a realization of the fact that their business is not a mere trade or art, but is one of the world's fundamental service industries—unsurpassed in its range of usefulness in all phases of human activity.

Could any material claim greater justification for publicity? The hundreds of useful and valuable functions performed by lime not only give justification for talking and writing about it, but they provide the foundation on which to build a solid, substantial structure of logical and convincing sales promotion. As a time-tested building material, a universally useful chemical reagent, and a vitally important aid to agricultural progress, no material is more deserving of recognition than lime. Its merits are real, its economy is proved, and its importance justifies the most emphatic and thorough sales promotion—by any legitimate means available to its producers.

Apply Technical Knowledge

All uses of lime involve the *technical control of its chemical and physical properties,* and its efficiency in any given application depends upon its composition and the way in which it reacts under varying process conditions. In the so-called process industries it functions primarily as a chemical reagent, though in many cases its physical properties also play an important part in securing desired results. In construction work it is manipulated and utilized because of its physical properties, but its chemical composition has a bearing on these properties, and chemical reactions are involved in the operation of slaking and in curing (as in the hardening and setting of mortar, plaster, stucco, etc.). Its agricultural uses are based upon chemical reactions with other compounds in the soil and in growing plants, and also upon the mechanical effects it exerts on the texture and other physical characteristics of the soil.

It is, therefore, imperative that those who would advertise the merits of lime must first know what these merits are and how they can be utilized. And it is equally necessary that the limitations of lime be understood, in order to avoid errors in outlining its proper field of usefulness. One lime is a high-grade finishing lime while another is not; one has a greater sand-carrying capacity than another; one contains impurities harmful to certain processes while another does not; one is more finely divided than another; and so on, through a long list of specific characteristics, each of which is either inherent in each individual lime or is conferred upon it by the conditions under which it is manufactured. And each of these specific sets of properties serves not only to differentiate between individual limes, but also to establish and limit their utility.

If you would know what features of your lime to advertise, investigate its properties. Technical research may tell you why one grade is not as plastic as it should be, or why you should eliminate certain impurities from your finished products; the degree of fineness of your hydrate may be shown to have a definite relation to its efficiency in a particular process. A certain rate of settling or of solubility may limit its value under other conditions. Research can also help solve the problems of your customers; determining the *effects* which are desired in their operations, and ascertaining whether or not your products can *produce these effects.*

Research and technical study can tell you what your lime will or will not do. They can determine the proper markets for you to serve. They can develop new markets for your products. And they will supply you with all the information needed as the basis of a comprehensive, logical and convincing series of advertisements that will tell the complete story of the services you are prepared to give to industry.

Truthfulness and Accuracy

Once you have ascertained (by field tests, laboratory studies or other means) both the merits and limitations of your lime, and have catalogued its properties with reference to various market requirements, you are ready to answer one big part of the advertising problem—namely, the question of what to talk or write about.

Talk about the results that can be secured if your lime is properly utilized. After all, that is really what you have to sell, and that is what you should talk about. Discuss the purity of lime and what this means as regards its efficiency for specific purposes. Tell about its plasticity, bonding power, freedom from core, water retaining power, or the tensile and compressive strengths of mortars made with it; and what these things signify to the building trades. Explain how lime acts to improve soil fertility, or why it is the most desirable reagent for specified chemical manufacturing operations.

And, above all, tell the truth about your lime. It will not pay you to do otherwise, either verbally or in print. If the value of lime for some particular refining process is measured by its percentage of water-soluble calcium oxide, don't try to convince the customer that 80% is just as good as 90%. Your advertising program cannot change the laws of chemistry, and you will save money by

not trying to do so. If you know that a small percentage of some ingredient in your lime is detrimental to a certain compounding process, why not admit the truth? By trying to hide it you fool nobody but yourself. The customer will find it out anyway, and he will be justified in blaming you if you wilfully withhold vital information. If you secure a certain business by exaggerating the merits of your lime, you may expect to lose it again, and to acquire at the same time a very poor business reputation. You may also damage the whole industry.

On the other hand, if you have reliable data to show that certain properties of your lime are thus and so, or that it will definitely react in just such a manner under specific operating conditions then say so, and stick to your story. If the story is true, you can deliver the service indicated and you are entitled to the business involved, in spite of any attempts to discredit you or your material. Tell the story correctly; back it up by adequate proofs, and get the business that is your due. *If the lime industry could secure all the tonnage that is today justified by the known, provable properties of lime, this industry would be one of the most prosperous in the world.* Emphasis of these properties, by advertising, can keep many copy writers busy without recourse to "information" that is not true. There are plenty of facts available to reach all possible markets.

Clearness, Brevity, Continuity

Any printed advertisement is intended to do three things—attract the attention of the reader, hold his interest and give him valuable information. If the subject matter is of sufficient interest, and is properly presented, and if the information given is of sufficient value, the advertisement has "punch" and the reader will be interested.

We are not especially concerned here with the problems of art and "layout" involved in attracting the reader's attention. These matters have to do with arrangement and spacing of cuts and text, style and size of type, kind and number of illustrations, eye-catching headlines, unusual and original make-up, artistic touches, etc. Though it is a very important feature in any advertising campaign, the subject is too big for discussion here, and should properly be cared for by those who are skilled in this department of advertising work, and able to harmonize the "head-line appeal" with the subject matter of the advertisement itself.

Assuming that the prospective customer can be induced to read your advertisement, what are you going to tell him? And how can you insure his reading and appreciating all that you have to say? The answer to both questions is just this: tell him what your lime can do for him; tell this concisely and in a logical, convincing manner; stick to one definite theme; present proof of the claims you make, and *tell the story in small installments.*

If the reader is a bricklayer, he will be interested in the properties of lime which will help him in his particular line of work. He wants to know about putty yield, rate of slaking, core, "fatness," sand-carrying capacity, strength, bonding power and other related subjects. A farmer is interested in various crop yields, soil acidity, the coagulating or flocculating effect of lime, its soil solubility, etc. The operator of a water purification plant will want to know about the percentage of available calcium oxide, the amount and nature of impurities, how the lime will behave in dry-chemical feeding machines, and so on. And all of them will ask *why?* They are anxious to improve the efficiency of their operations, but they must all be shown some proof before they will accept statements which, so far as they know, may not be entirely true. It is important to avoid "side issues" and to make your printed salesmen tell a connected story, dealing with one group of facts for one definite audience, and it helps a lot if you can publish statistical proof of your statements.

Getting and Holding the Prospects' Attention

Finally, it is highly desirable to avoid "crowding" your story. One high-priced garment in a well lighted show window will draw more attention, and receive more critical examination, than it would if it were surrounded by a dozen other garments of a similar nature. Similarly, one pertinent and worth-while fact about lime, properly expressed in a few words, will deliver its message more effectively than if it were only one of a dozen more or less related facts—all jumbled together and filling an entire page of small type. The reader's eyes tire, and he loses interest before he gets to the end of an advertisement that tries to cover too much territory. Or, if he does read it all, he may forget the first ten points you tried to make, and only remember the last two. It is better to present the twelve facts in as many separate ads—making them more emphatic, and letting each one sink in before presenting the next.

Choice of Advertising Media

The type of publication to be selected as a vehicle depends upon the origin of the advertising campaign; the features that are to be emphasized, and the audience to be approached. A general appeal for recognition of the fundamental value of lime as an industrial chemical should properly be sponsored by the entire lime industry, and should be directed to all the chemists, chemical engineers and executives of chemical companies in the country, by being displayed in the technical and trade journals (of national or international circulation) which are consulted by these men.

Such a program of national advertising must necessarily be couched in rather general terms and is designed primarily to create an active interest in the fundamental value and utility of lime. Many of the individuals whose attention has been attracted by this means will want more specific information as to how a particular grade of lime, obtainable in a certain locality, will serve the requirements of a specific industrial operation.

This places with individual lime manufacturers both the duty and the privilege of supplementing the national campaign by means of regional or local campaigns, setting forth detailed information and explaining specific applications of their products. A program of this kind involves the discussion of local problems; the choice of advertising media which will reach local industries and individuals; the exploitation of definite, specific features, and the careful planning and wording of timely, interesting and instructive "stories."

Campaigns of this nature may be prosecuted effectively both by the use of company booklets and by means of a series of advertisements carried in trade journals which are read by the right people in any given territory.

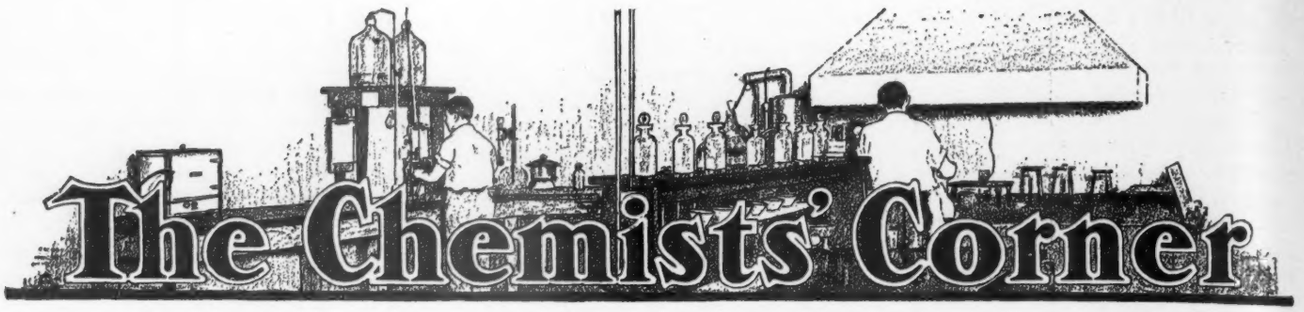
The Customer's Viewpoint

The final point I want to emphasize is the importance of trying to appreciate the viewpoint of the very human individuals who may read the advertising matter you have so carefully planned and prepared. Many of them are business men engaged in worthwhile occupations, just as you are. Most of them hold positions of responsibility. Otherwise they would not be prospects for your goods. Their positions and duties require them to possess considerable intelligence; they have other things to think about besides lime; they probably know more about their own business than you do, and their time is valuable.

If you would make your advertising campaign wholly consistent with the merits and uses of your products, take pains to respect the intelligence and conserve the time of your audience. State important facts clearly and concisely; show the necessary authority as required by circumstances; use terms familiar to your prospects wherever possible; stick to discussion of his problems; be as dignified as the importance of the subject demands, and avoid any appearance of either a patronizing attitude or of what is commonly called "bally-hoo."

Conclusion

An advertising campaign that gives proper consideration to the factors and principles enumerated above will be one that is consistent throughout. It will cover the field thoroughly, efficiently and in logical order. It will not "run out of gas." And, if conducted vigorously, systematically and continuously, it will sell the services of the lime industry to the other industries of the world.



Opacity Factor in Specific Surface Determinations

May Have Possibilities as an Index of Quality or Indicator of Chemical Composition

By H. R. Brandenburg,
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IN THE COURSE of investigations conducted by the Cowell Portland Cement Co. on the experimental production of various types of special cements, the limitations of the 200-mesh sieve as a criterion of the relative fineness of cements, and the impossibility of correlating physical test results and other manifestations to this arbitrary fineness measure, became so apparent that the need for a more dependable method of fineness evaluation appeared imperative.

After due deliberation involving a consideration of the merits of the various types of apparatus available upon the market, such as air separators, elutriators and the still more modern specific surface apparatus, we chose the "Turbidimeter" produced by Alexander Klein, of the University of California.

This apparatus is more generally known as the "U. C. Turbidimeter," and since all measurements with it are carried out under practically static conditions it appealed to us strongly for its simplicity with respect to both construction and operation.

A full description of this instrument, its theory and operation, has been presented by Mr. Klein in a paper at the June meeting of the American Society for Testing Materials; to those desiring complete details we would recommend a study of this most interesting paper.

For our present purpose a briefer description of the instrument and its method of operation will suffice to clarify the text and object of this article.

The general appearance of the instrument, its arrangement and accessories are shown in the accompanying illustration, wherein the position of the light source, cell and dishes is indicated by letters corresponding to those given in the general description.

Discussing the instrument first, we would say that a constant intensity light source (L), supplying a beam of approximately parallel light, is allowed to fall upon the glass bottom dish (F) filled with 30.0 grams of pure castor oil, which serves as a radiant heat filter; thence passing through an orifice to impinge upon the photronic cell (C). Glass bottom dishes (D).

The current output of the photronic cell registers on the micro-ammeter (M) having a range of 0-50 micro-amperes.

The initial light intensity is adjusted by means of the rheostats (R) to remain constant at any convenient point; generally at the maximum setting of 50.0 micro-amps.

To ascertain the light absorption of pure castor oil we weigh 25.0 grams into another glass bottom dish and place this in a position intermediate between the heat filter and the photronic cell; let us call this the analyzing position (A).

The light absorbed by the clear castor oil (A) causes a diminishment in the current output of the cell (C) which is reflected in a lowered ammeter reading; we will designate this reading as Intensity—I_1.

In the determination of the specific surface of a cement we weigh out exactly ¼ gram of the cement and disperse this thoroughly in 50.0 grams of castor oil; also for the evaluation of the constant K we proceed in the same manner as above described for the specific surface by dispersing a given sized sieve fraction in castor oil.

By now weighing 25.08 grams of such dispersion into a glass bottom dish and substituting it for the "clear" castor oil in the analyzing position (A), a still further reduction in light intensity will be indicated in the ammeter reading; this intensity we will designate I_2.

Since the theory of operation is based upon the broadly expressed principle that for very small opaque particles at very low concentrations the change in the intensity of light is logarithmic, the specific surface is calculated by the formula

$$Log._e \frac{I_1}{I_2} = KS$$

S = the specific surface.
K = a constant for any given cement.

As above stated, the constant K is determined instrumentally, and in an identical manner as the specific surface by using for the determination of the constant the sieve fraction of cement remaining between the 200- and 325-mesh sieve.

On the assumption that the particle size distribution of the cement between the given sieve sizes is uniform, that the particles are spherical and that their average diameter is the arithmetical mean of the sieve apertures (e. g. 58.5 microns) we calculate the surface of the fraction by the formula

$$S = \frac{6}{pd}$$

S = the specific surface.
p = the specific gravity of the material.
d = the average diameter, in centimeters.

As practiced by us, the light intensity, or ammeter readings I_1 and I_2, respectively, stand for clear castor oil and at a concentration of ¼ gram of either cement, or fraction, in 50.0 grams of castor oil, we do not make a further dilution for check determinations "on the same original sample."

Since the clear castor oil is used as a point on the logarithmic plot and inasmuch as we are working with the higher concentration only, as above stated, the logarithm of the turbidity ratio is divisible by 2.

Considering also that all values are used in ratios, we may simplify the calculations by using the natural logarithm corresponding to 1/10 of the ammeter reading, thereby avoiding interpolation.

Also, in the use of the common log., we may omit the use of the characteristic and use the mantissa only, since the point of decimal will become self-evident; thus further simplifying and expediting all calculations.

A record of a cement involving both specific surface determination and K evaluation may serve to illustrate the simplest method of making and recording such calculations:

Given:
Average mean diam. of fraction ..... 58.5 micron
Specific gravity of cement 3.15
Specific surface of fraction ..... 326. sq. cm. per gr.

$$S = \frac{6}{pd} 10^{-4}$$

$S = 326$ and,
Log. 326 = 5132.
Initial light intensity setting of instrument = 50.0 micro-amps.

Ammeter reading for clear oil = 46.1/10 Log.$_e$ = 1.5282
Ammeter reading for fraction = 38.6/10 Log.$_e$ = 1.3507
Ammeter reading for cement = 24.2/10 Log.$_e$ = 0.8838

——— Fraction ———

Concentration:
0 ..... 46.1 = Log.$_e$ 1.5282
250 Mlg..... 38.6 = Log.$_e$ 1.3507
0.1775

and; 0.1775/2 = 0.0887
Log. 0.0887 = 9479
Log. 326. = 5132
4347

hence, K = 2.72.

——— Cement ———

Concentration:
0 ..... 46.1 = Log.$_e$ 1.5282
250 Mlg..... 24.2 = Log.$_e$ 0.8838
0.6444

and; 0.6444/2 = —0.3222
Log. 0.3222 = 5082
Log. K = 4347
635

hence, specific surface = 1184. sq. cm. per gram.

The example illustrates more clearly than words the extreme simplicity of the method of operation and calculation of the results obtained.

Since the purchase of the instrument a year ago we have made many determinations upon experimental and commercial cements, the latter both of domestic and foreign origin.

We have checked and rechecked a great number of determinations to a most gratifying degree of reproducibility and we consider this instrument capable of yielding closely reproducible values.

As is evident, the instrument is primarily designed for a quick and dependable determination of *total specific surface*, though by the use of accessory equipment particle size distribution may also be determined with it.

As discussed, this type of instrument measures the extent of light obstruction in its passage through a cement dispersion in castor oil as against a standard light through pure castor oil, the relative degree of activation of a photronic cell being measured with a micro-ammeter.

Hence, to make use of this instrument it becomes first of all necessary to arrive at some quantitative measure of the light obstructing qualities which a given cement possesses and (or) the clinkers from which they have been derived.

It has been considered by the originator of this apparatus, and apparently proved, that when a cement is sieved to pass the 200-mesh screen and the flour-free portion taken from what remains on the 325-mesh screen, we have a product, or fraction, in which the degree of subdivision reached is such that each individual particle is essentially homogeneous with respect to its physical composition, and that the quality of opacity found thereon is representative of the cement as a whole.

This fraction, with an accepted average particle size diameter of 58 5 microns, has therefore been selected as a basis of representing the average light obstructing qualities of all of the cement particles comprising a given cement.

The instrumental results obtained on this fraction, therefore, become a quantity of light obstruction, and (or) light absorption, a quantity very aptly named by the originator of the instrument "The Opacity Factor," e. g., the constant K.

The opacity factor, or K, once established *and providing all conditions remain the same,* should remain permanently unaltered for a given cement.

As appears evident, the opacity factor will vary in harmony with the compound composition of a clinker, or cement, also as its specific gravity. It would also appear reasonable, from all considerations, that to a high iron cement there should correspond a higher opacity value than to a low iron, or a white cement.

This much is readily evident, and when in the course of routine work minor variations in the opacity factor are noted—on a given cement—we are apt to attribute such divergences to manipulative errors and the limitations of the instrument.

While it may be possible to bisect a full one-half ammeter division into a quarter, more generally than otherwise, ammeter readings can only be made to the nearest 1/10 division, thus indicating that the possible K error lies within four parts in the second decimal.

This apparent limitation, for practical purposes, is insignificant according to our findings, since the average error thus introduced appears to lie within a specific surface value of about 25 sq. cm. per gram, a difference infinitely closer for a critical comparison of relative fineness versus developed physical manifestations than any result obtainable by a sieve analysis.

When, however, opacity factor values of pertinently greater differences are encountered in the routine control of a given product, then we begin to look for the causes contributing to such variations.

And, indeed, we can find locked within that heterogeneous system comprising our lump of sintered clinker a mass of food for thought; we can visualize changes in structure due possibly to slight differences in burning, or cooling, an infinite change in ratios between glass and crystalline matter brought about by the same causes, also varying degrees of oxidation of the iron embracing compounds due to flame condition, finally varying amounts of free lime, or substantially free lime.

Microscopical, or petrographical, methods applied to the examination of a portland cement clinker do not appear to have yet sufficiently advanced to clearly and quantitatively fix such structural differences of composition and with it to explain the physical differences of behavior of the product.

Since, in this method of determining specific surface, advantage is taken of the law previously referred to, which embraces the relative degrees of light transmission, or

Type of Turbidimeter adopted for tests, using castor oil as a medium of suspension

respectively absorption, we may say that the opacity factor is also an optical constant depending not merely upon the depth of coloration of a substance but upon its mineralogical structure as well; if one or the other is changed a change in the constant must inevitably follow.

With this in mind we have done considerable work and have ascertained some of the causes which appear responsible for a change in the opacity factor; we have not, however, always been able to explain the wide differences in physical manifestations noted.

Experimentally we have sufficiently assured ourselves to feel justified in stating that for any given clinker composition burned under optimum burning conditions there can exist only one opacity factor, which will then be at maximum; when the burning conditions fall below optimum, or in any way differ from normal, then the opacity factor will drop below the maximum established for an optimum burning condition.

Therefore, the constant K can conceivably also be regarded as an expression of quality for any given product, cement or clinker.

This, evidently, can hold true only for cements of identical compound compositions; it would hardly be proper to compare cements of varying compound compositions on the basis of opacity factor values.

Since, as above suggested, the iron content of a cement is the primary influence for the depth of coloration of a cement, and with this the prime determining variant of the opacity factor, it becomes apparent that the high iron cements must possess the higher opacity values and white cements the lowest; this irrespective of their relative merits as cementitious bodies.

Before going into this latter subject further we will first consider the chemical composition of a cement proper and the "fraction" derived therefrom to see if any material change has occurred in chemical composition, which could unduly influence the opacity factor relative to the cement proper.

At various times and for different cements such analyses were made without finding any, to us, pertinent appearing variations; we will cite herewith two of such analyses on cements of a quite different compound composition and from different manufacturers.

ANALYSIS

—Cement X—			—Cement Y—	
Cement	Fraction		Cement	Fraction
21.04%	21.28%	$Si O_2$	23.08%	23.35%
2.35	2.57	$Fe_2 O_3$	2.10	2.10
7.05	7.25	$Al_2 O_3$	4.12	4.40
64.85	64.75	Ca O	66.56	66.26
1.36	1.32	Mg O	1.47	1.50
1.75	1.22	$S O_3$	1.44	1.23
1.15	.84	Loss	1.01	.80
99.55%	99.23%	Total	99.78%	99.64%

We would consider the variation of the prime compound forming constituents between the cement and the thereto corresponding fraction to be nominal in extent, in character and effect upon the opacity factor.

We may therefore rightly assume that since the chemical and hence compound composition of the fraction, for all practical purposes, is identical to the cement proper, consequently also the opacity value, if considered as a function of chemical composition, is relatively proportional.

Previously, I mentioned that the opacity factor may vary for the same potential compound composition and dependent upon treatment of the clinker during the burning stage, or as affected in the subsequent cooling stage; experimentally this has been ascertained in various ways.

For instance, by splitting the clinker discharge of a normally operating kiln, producing a sound and normal type of clinker, into two portions, simultaneously wherein one portion is air cooled very slowly with the resulting formation of a sparkling jet black clinker and by suddenly chilling the other portion (for example, in water) with the resulting formation of a lighter colored clinker, one will obtain two widely differing opacity values for these two types of clinker even though their potential compound composition, from the chemical standpoint, will be identical. Also the physical properties of the cements made from such products may differ.

In the burning of cement clinkers, experimentally or otherwise, through intentionally or unintentionally brought about firing conditions deviating from normal operations, a type of clinker is sometimes produced which is characterized by a dark exterior shell terminating in a much lighter colored core; this type of clinker is vaguely referred to by some as being an "overburned" clinker.

Even from a cursory examination one would conclude that though the chemical composition of shell and core be the same, that the degree of oxidation of the iron embracing compounds is not the same, that the mineralogical structure very probably differs, and that very possibly intermediary compound compositions exist not covered by the applied and potential compound composition as conventionally calculated for normal clinkers.

As nearly as such was feasible, clinkers of that general type were segregated into the apparently well burned portion and the portion consisting essentially of the yellow core clinker.

Such samples were taken from the same kiln, at the same time, and presumably originated from the same mix; a fact verified by the complete chemical analysis herewith cited.

ANALYSIS OF CEMENTS MADE FROM:

Light core clinker		Dark shell clinker
21.66%	$Si O_2$	21.86%
2.40	$Fe_2 O_3$	2.35
6.72	$Al_2 O_3$	6.71
64.96	Ca O	65.06
1.44	Mg O	1.38
1.54	$S O_3$	1.54
.84	Loss	.80
99.56%	Total	99.70%

.47%*	Fe O*	.26%*
.47	Insol. residue	.45
.70	Free lime	.51
3.18	Specific gravity	3.17
2.47	Opacity factor	2.61
1332.	Specific surface	1237.

*Note: The Fe O content reported in the analysis with and as $Fe_2 O_3$.

PHYSICAL TESTS

95.6	Fineness: 200-mesh	94.9
87.8	Fineness: 325-mesh	86.6
2:50	Set—Initial G.	2:50
6:25	Set—Final G.	5:50

Tensile: 1:3 standard sand

282 lb. per sq. in.	3	days	310 lb. per sq. in.
290 lb. per sq. in.	5	days	337 lb. per sq. in.
330 lb. per sq. in.	7	days	370 lb. per sq. in.
405 lb. per sq. in.	28	days	480 lb. per sq. in.

Considering that the separations, as described, were of an unavoidably coarse character, it must be evident that all results are somewhat obscured, one type by the other.

Notwithstanding this we have here a striking illustration on the influence of the character of the burning upon the physical properties resulting from these types and their reflection in the change in opacity factor value.

We have made a number of tests of this character and the test and results above cited present an average type while operating under the particular operating conditions maintained during that period.

With a change in burning conditions the variation in opacity factor, or the physical properties, may be greater or much less and such variations appear to be linked in some manner with the variation in ferrous iron that may exist in the clinker.

Based upon our findings we have arrived at the conclusion that all yellow core clinkers are not necessarily of inferior quality but, subject to further evidence to the contrary, must be regarded with suspicion.

That their relative merits, that is relative to a normal clinker of like composition, can be gauged by the drop in opacity factor value from that of the normally burned product.

That, whereas the drop in opacity factor value may, in part, be ascribed to the lighter colored ferrous compounds which generally form a greater or lesser part of such yellow core clinkers, it would seem that their amount per se is insufficient to account for the great difference in physical characteristics between such yellow core clinker and the obviously normally burned shell thereof; we must therefore subscribe to the thought of the existence of structural differences.

We endeavored to ascertain mineralogical differences microscopically but were unsuccessful in our efforts; it is possible that recourse must be taken to X-ray spectrographic methods, or other means, for their establishment.

In considering the effect of ferrous iron it seems also possible that we may have to differentiate between the changes brought about through the presence of ferrous iron during the formative stage of a clinker and the intentional reduction of the iron embracing compounds of an initially normally

burned, and so formed, clinker for the purpose of lightening its color.

Differences in cooling treatment may also serve to modify the opacity factor and cause a considerable divergence from that corresponding to the normal clinker.

We may illustrate this latter statement by citing an average condition and one of several tests made.

A clinker immediately following its discharge from a kiln was split into two portions, one being air cooled while the other was dumped into an excess of water.

Two distinct types of clinker resulted, one a sparkling jet black, the other light and of practically a tan shade.

The respective analyses, opacity factors and physical test results were as follows:

Cement from air-cooled clinker	ANALYSIS	Cement from chilled clinker
22.30%	SiO_2	22.32%
2.31	Fe_2O_3	2.13
6.29	Al_2O_3	6.53
64.85	Ca O	64.75
1.23	Mg O	1.23
1.59	SO_3	1.48
0.83	Loss	1.00
99.40%	Total	99.44%
Nil	Fe O	Nil
0.98%	Free CaO	10.5%
2.82	Opacity factor	2.24
2.78	Check on O. F.	2.26
1300.—	Specific surface	1350.—

Tensile test 1:3 standard sand

160 lb. per sq. in.	1 day	150 lb. per sq. in.
293 lb. per sq. in.	3 days	273 lb. per sq. in.
323 lb. per sq. in.	5 days	317 lb. per sq. in.
345 lb. per sq. in.	7 days	338 lb. per sq. in.
460 lb. per sq. in.	28 days	420 lb. per sq. in.

In the above test, a condition which held true for all on the average, the physical test results, as appertaining to the tensile strength, and excepting the 28-day test, differ but slightly despite the enormous difference in the opacity factor values.

It would appear, therefore, that the bleaching of the clinker through sudden chilling while lowering the opacity factor enormously does not reflect the possibility of structural changes of the order and in the degree indicated through the presence of ferrous compounds during the formative stage of a portland cement clinker.

As a matter of fact, except for the nominally higher 28-day strength for the air cooled clinker we have noted no particular different physical properties, or manifestations, between these two types of clinker, except it be an apparently harder grindability for the chilled clinker.

This seems contradictory to experience with all other materials similar in character and requires further investigation and verification, since one naturally would assume that the glass matrix of a clinker would suffer a shattering effect and that crystallization would verge more towards a microcrystalline order of easier grindability.

These analyses being in good agreement bring out very clearly the considerable opacity factor differences which can be imparted to clinkers from the same burn and of the same identical chemical composition by normal and extreme modes of cooling condition; it would seem likely that more moderate conditions of cooling, and intermediate between the two, may result in less pronounced variations.

The moral appears obvious, namely, that it would seem possible to insure the uniform maintenance of any set condition, of burning, cooling or heat treatment, by opacity factor control.

The experiments conducted to date, while as yet insufficient in scope to permit the voicing of a decisive opinion, strongly indicate the probability that the strongest cements—for any given composition—also possess the highest opacity factor value.

That, under normal operating conditions, opacity factor values are reasonably constant and closely reproducible, may be evident from a consideration of the results given in the following table. These were obtained from a steady run of mill grinds; each result representing the average of approximately 2500 bbl. of cement.

A German cement has been included merely for its informative value on reproducibility of results.

CEMENTS

Sample	—Fineness, passing— 200 Mesh	325 Mesh	K — Found	K — Checked	— Specific surface — Found	Specific surface — Checked
1	91.1%	80.8%	2.64	2.68	1200	....
2	92.6	82.5	2.66	...	1240	....
3	92.8	82.0	2.64	...	1220	....
5	90.1	79.4	2.68	2.72	1120	1120
6	91.8	81.4	2.64	...	1190	....
7	89.7	77.8	2.70	2.68	1150	1148
8	91.5	81.0	2.68	2.68	1210	1200
German						
1	82.9	72.3	2.78	2.72	1000	1000
2	94.8	87.6	2.72	2.72	1350	1335

When checks were made it was customary to cut out a fresh sample from which a new fraction was obtained; the specific surface also was checked on a freshly cut portion.

The reproducibility and closeness of results is therefore not merely gratifying but in fact quite remarkable.

We may mention at this point that though castor oil is quite a viscous substance the viscosity is naturally lowered with an increase of temperature.

For this reason we prefer to work with the oil at a temperature not exceeding 70 deg. F., and if necessary chill the cement-oil dispersion down to that temperature just prior to making the final weighing preceding the instrumental determination proper.

When working with the oil at more elevated temperatures it is possible to reach the maximum reading in the cell under test much quicker but, so it would appear to us, at the sacrifice of some accuracy.

This is probably due to the more rapid and hence less even settling out of the cement particles; this holds particularly true for the larger particle size fraction used in the constant *K* determination.

We would say, however, that for practical routine such precautions are not necessary; but we do recommend such practice in careful check work on the constant.

It is also for the very reason of the greater viscosity of the dispersing medium used with this method that we logically preferred it over other types using far less viscous mediums.

At 70 deg. F. we found, for instance, the viscosity of a coal oil at 39 seconds on the Redwood viscosimeter whereas that of the castor oil was 2520 seconds at the same temperature.

Furthermore, the essentially static operating condition obtained with this instrument makes possible the procuring of the highest degree of reproducibility and the obtainance of concordantly relative values.

Our tests appear to indicate that an improvement in clinker quality, for the same composition, can readily be ascertained by a corresponding rise in the opacity factor value.

There are also other lines of research, such as the ageing of portland cement, the possibility of structural changes under suitable influences and so forth, in which type of investigations the opacity factor may be destined to play its part in fixing the magnitude of such changes.

This article was held in abeyance awaiting the results of a study started on the ageing of portland cement clinker; regrettably the data obtained to date are not sufficiently conclusive to warrant their publishing at this time, but we hope to be in a position to publish these results in the near future.

Cement

Lehigh Portland Cement Co., Allentown, Penn., is to employ many of its men to make plant improvements, at its Metaline Falls, Wash., plant, during the regular winter shut-down period. It is said that 12 blending bins are to be added as one of the improvements.

◈ ◈ ◈

Glens Falls Portland Cement Co., Glens Falls, N. Y., at its annual meeting February 5, elected G. F. Bayle, Jr., president. T. F. Kalbfleisch was elected vice-president, and F. L. Bayle was named plant superintendent to succeed the late F. P. Monaghan.

◈ ◈ ◈

Trinidad Portland Cement Co., Fort Worth, Tex., recently purchased two Vanderwerp recuperators for clinker cooling, to be installed on its 11 ft. 3 in. x 250-ft. kilns. These are said to be the largest Vanderwerp recuperators made to date.

Hints and Helps for Superintendents

Steel Ball for Breaking Boulders

(Contributed)

USE of a steel ball or "skull cracker" for breaking boulders in quarries is not new. Its use has been described in these pages before, but, nevertheless, the following technique and experience is interesting. Bill Borgette is superintendent of the Stonybrook plant of the Massachusetts Broken Stone Co. His equipment includes a Lorain 75 crane with a 50-ft. boom and a 6600-lb. steel ball. Our contributor describes its use thus:

"Bill Borgette claims that he has eliminated two or three men and has been better able to clean up his quarry floor next to the face where before they have always had large boulders which had to be kicked aside, drilled and blasted individually, long after the material shot from that face had been excavated and put through the crusher.

"This machine had been working just about a week when I got over to the quarry and had about one-third of the large boulders broken up by that time.

"Just recently I had a report from Mr. Robinson, a partner in the company, that they were changing the machine over for clamshell operation, which means that the machine worked approximately three weeks cleaning up all the large boulders which had been lying around on the quarry floor.

"Mr. Borgette also claims that there is considerable hazard to blasting these boulders and feels rather proud that the skull cracker works so satisfactorily and takes care of such a large tonnage.

"You will note that the ball can be swung at the vertical face to loosen stones as well as drop vertically to break those on the ground."

Steel ball loosening stones on vertical face

Eliminating Vibration in Electric Motors

By J. A. Dowler,
Chief Electrician, Three Forks Portland Cement Co., Hanover, Mont.

OCCASIONALLY an electric motor which is properly installed and in good mechanical condition will vibrate so badly that it is practically impossible to anchor it to its foundation firmly enough to eliminate this movement.

The cause of motor vibration similar to that mentioned above is very likely to be an accumulation of dust in one side of the rotor, the weight of which has thrown the motor out of balance. Motors which are not in use for some time sometimes acquire this defect if they are subjected to more or less dust, or dust which has accumulated in a running motor may fall to the bottom side of the rotor when the motor is stopped.

To correct this trouble the motor should be thoroughly blown out with compressed air if available, or even, with a little more work one can accomplish the desired results with hand bellows.

At small plants, sometimes an outside electrician must be called into service to investigate this apparently mysterious action of the motor.

Steel ball breaking boulders

Oil Burner Heated Asphalt Tank for Crushed Stone Mix

By Ralph H. Butz,
Allentown, Penn.

ZIEGENFUSS QUARRIES, Allentown, Penn., have an oil-burner installation to heat a 10,000-gal. tank of "Ugite." The installation was made by W. S. Reichenbach & Son, Allentown, local heating contractors.

The quarry management faced the problem of keeping a constant supply of Ugite at the proper temperature to speed up deliveries of prepared paving material for road topping.

Previous to the installation of this tank, the Ugite had always been purchased in steel drums and heated in a small kettle over a wood-fired oven. Due to the small margin of profit on paving material, it was found that this old-fashioned method was too costly. There was a waste of labor and material, and costly delays for the trucks while they waited for the paving mixture.

This tank, with piping for steam heat on the inside, was elevated 10 ft. above the ground. Directly underneath, in a concrete-lined pit, an electrically-operated pump was installed to pump the Ugite from the railway cars into the tank. On one side of the tank a small building was erected to house the heating equipment.

The steam boiler used for this purpose is of the cast-iron type used for domestic heating purposes, carrying steam pressure up to 15 lb. per sq. in. The steam from the boiler flows through the pipes in the tank and keeps the Ugite at the proper flowing consistency regardless of weather conditions.

The oil burner is regulated by a thermostat connected with the tank. The liquid is kept at a uniform temperature, avoiding the waste of fuel that would occur without proper control.

It was explained by J. Heiberger, general manager of the quarries, that the oil burner was selected for this equipment because of the full automatic feature and the saving in labor. He is of the opinion that the saving in labor costs and the price advantage gained by purchasing the material in tank cars will soon pay for the cost of the equipment.

An extension of the steam pipes to the railroad siding has been made so that when tank cars arrive during cold weather the material may be heated in the cars until it is ready to be pumped into the overhead tank.

"The installation has been in use for about two years and has met our expectations," re-

marked Mr. Heiberger. "Our business on prepared paving stone has been increasing very rapidly and we are now in a position to produce this mixture more economically than most of our competitors and to guarantee delivery as specified in our contracts."

The Ugite flows by gravity through a pipe line from the tank to the mixers. The crushed stone arrives in one-ton cars on one side of the mixer into which the load is emptied automatically. Almost simultaneously several gallons of the Ugite flow into the mixer, and a few minutes later the properly prepared paving stone flows down a chute to the waiting trucks, or into the storage bins where a quantity of the material is kept on hand at all times.

Asphalt tank for heating crushed stone mix

Three Ways to Cut Costs

By Edgar Garner

WE OPERATE a small stone quarry, and most of our spare time is spent improving our plant. Here are a few things we have done, which by suggestion might help some one else.

(1) We use a chain drive from our elevator to our screen—a distance of about 6 ft. The chain was continually coming loose and flapping around, so we took a sprocket —the same number as is used on the shaft— and used it as an idler. It works fine.

(2) Our stone is a soft limestone. We use an air drill, and when it is wet or we are drilling deep, the drill does not blow all the cutting out. We took a gas pipe of the desired length, put on connections to fit the hose, and so blow out all the cuttings.

(3) We also use an Erie steam shovel. Recently we broke one of the bolts that hold the boxend of the crowding engine on the boom. We were unable to remove the 1½-in. nut as we did not have a socket of that size. We heated a 1½-in. union, fitted it over the nut, screwed a nipple into the union and so were able to use a pipe wrench to loosen the nut.

Diaphragm Pumps

THE USE of diaphragm pumps in the rock products industries is a rarity. Just why is one of those unexplainable things, for the use of this type of pump in the metal mining field is quite common, and its reliability under conditions of excessive abuse is proverbial. Where it is desired to lift water 20 ft. (or less) under conditions where centrifugal pumps would lose their priming, or where excessive amounts of sand and mud are encountered, these pumps will give a good account of themselves. The upkeep is low and a 2-hp. gasoline engine will operate a double diaphragm pump and deliver about 400 gal. of water per min. However, such pumps find their greatest use where a small amount of water is to be continuously lifted; say 10 gal. per min. Under such conditions the pump will be sucking air at all times; sufficient air to kill other types of pumps, but the diaphragm pumps keeps right on, regardless.

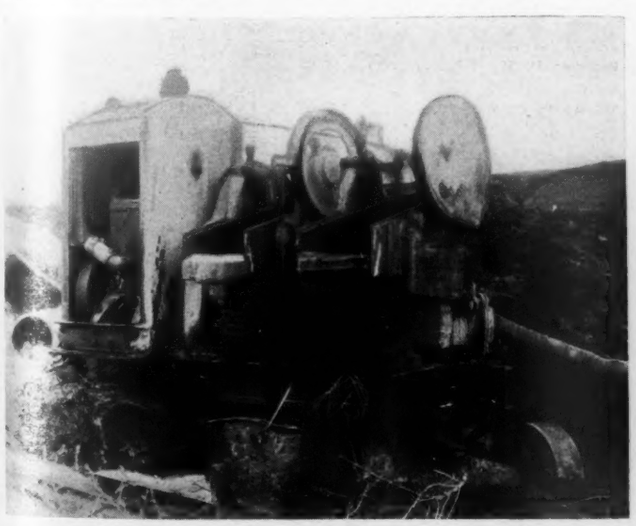
A second feature is that a multiple suction can be used. That is several suction pipes can be connected to the same pipe and all can be used at the same time.

In the illustrations shown, a Le Roy (3-hp.) gasoline engine is direct-connected to a duplex diaphragm pump. The pump has a 5-in. suction line and this 5-in. line is served by five 3-in. suction lines, each provided with a suitable foot valve. Each of the 3-in. lines also has a service cock installed in the line so as to throttle or otherwise control the flow of liquid through that particular line.

Multiple Pumping

The one pump shown is pumping water from five different places in an excavation. Each of the 3-in. suction lines has been throttled down to a minimum, but still open sufficient to pump all the water from that locality. Incidentally, each foot valve is also sucking considerable air, but the pump does its duty just the same. This installation is also arranged so that if the pump shown goes down, a second one can be quickly pulled into its place and the operation continued.

The one shown had been running continuously (24 hours per day) for 15 days without attention other than gas, oil and water, when these pictures were taken.



Diaphragm pump used in rock products industries. Left: Three hp. gasoline engine connected to diaphragm pump. Right: Pumping water from five different places in an excavation

RECENT QUOTATIONS ON ROCK PRODUCTS SECURITIES

Stock	Date	Bid	Asked	Dividend
Allentown P. C., com.[47]	2-20-35	5	7	
Allentown P. C., pfd.[47]	2-20-35	5	7	
Alpha P. C., com.[47]	2-21-35	17	18	.25 Apr. 25
Amalgamated Phos. 6's, 1936[47]	2-20-25	100	101	
American Aggregates, com.[48]	2-21-35	1	2	
American Aggregates, pfd.[48]	2-21-35	3	5	
American Aggregates, 6's 1st mtg. 3/6's, 1943 new bonds[48]	2-21-35	45	50	
American Aggregates, 6's 1943, old bonds[48]	2-21-35	45F	50F	
American L. & S., 1st 7's[48]	2-21-35	96	....	
Arundel Corp., com.[48]	2-21-35	17	....	
Ashgrove L. & P. C., com.[49]	2-21-35	11	....	
Ashgrove L. & P. C., pfd.[49]	2-21-35	96	....	
Bessemer L. and C., Class A[47]	2-20-35	3	4	
Bessemer L. and C., 1st 6½'s, 1947[46]	2-21-35	30½F		
Bessemer L. and C., cert. of dep., 1947[46]	2-20-35	30	35	
Bloomington Limestone, 6's[47]	2-20-35	8	12	
Boston S. and G., new com.[37]	2-21-35	1½	3	
Boston S. and G., new 7% pfd.[37]	2-21-35	5½	8	
Boston S. and G., 7's, 1939[37]	2-21-35	70	....	
Calaveras Cement, com.[40]	2-20-35	⅞	1⅛	
Calaveras Cement, 7% pfd.[40]	2-20-35	31	34	
California Art Tile, A[9]	2-20-35	1	2	
California Art Tile, B[9]	2-20-35	....	½	
Canada Cement, com.[42]	2-22-35	7	7½	
Canada Cement, pfd.[42]	2-22-35	61	62	
Canada Cement, 5½'s, 1947[42]	2-22-35	102½	104	
Canada Crushed Stone, bonds[42]	2-22-35	90	....	
Certainteed Products, com.	2-21-35	5⅛	5½	
Certainteed Products, pfd.	2-21-35	28	30	
Certainteed Products, 5½'s, 1948	2-21-35	71½	73⅞	
Consol. Cement, 1st 6½'s, 1941[47]	2-20-35	29	31	
Consol. Cement, pfd.[47]	2-20-35	2	3	
Consol. Oka S. and G. (Can.), 6½'s[42]	2-22-35	....	25	
Consol. Rock Prod., com.[47]	2-20-35	1	2	
Consol. Rock Prod., pfd.[47]	2-20-35	2	3	
Consol. Rock Prod., units[47]	2-20-35	3	5	
Construction Mat., com.[47]	2-20-35	1	2	
Construction Mat., pfd.[47]	2-20-35	2	3	
Consumers Rock & Gravel, 1st mtg. 6½'s, 1948[47]	2-20-35	30	33	
Coosa P. C., 1st 6's[47]	2-20-35	17	25	
Coplay Cement Mfg., pfd.[47]	2-20-35	25	30	
Coplay Cement Mfg., 6's, 1941[47]	2-20-35	70	80	
Cumberland P. C., 7's, 1937[47]	2-20-35	70	80	
Dewey P. C., com.[47]	2-20-35	90	100	
Dolese and Shepard[49]	2-21-35	9	12	
Dufferin Pav. and Cr. Stone, com.[42]	2-22-35	....	2½	
Dufferin Pav. and Cr. Stone, pfd.[42]	2-22-35	26	28	
Federal P. C., 6½'s, 1941[47]	2-20-35	26	31	
Fla. Port. Cement, 6½'s, 1937[46]	2-20-35	95	97	
Florida Port. Cement, units[47]	2-20-35	17	19	
Giant P. C., com.[47]	2-20-35	2	4	
Giant P. C., pfd.[47]	2-20-35	10	15	
Gyp. Lime & Alabastine, Ltd.	2-22-35	6¼	6⅜	
Gyp. Lime & Alabastine 5½'s, 1948[47]	2-20-35	80	85	
Hawkeye P. C., cap.[49]	2-21-35	29	....	
Hercules Cement, com.[49]	2-21-35	18	....	
Hercules Cement, 7% pfd.[49]	2-21-35	92	....	
Hermitage Cement, com.[47]	2-20-35	8	12	
Hermitage Cement, pfd.[47]	2-20-25	50	60	
Ideal Cement 5's, 1943[47]	2-20-35	100	102	
Ideal Cement, com.[47]	2-20-35	38	40	
Indiana Limestone 6's[47]	2-20-35	9	11	
International Cement bonds, 5's, 1948	2-21-35	100½	101¼	
International Cement, com.	2-21-35	28	28	
Kelley Island L. and T.	2-15-35	12½	actual sale	
Ky. Cons. Stone, 6½'s, 1938[47]	2-20-35	10	15	
Ky. Cons. Stone, com.[47]	2-20-35	1	2	
Ky. Cons. Stone, pfd.[47]	2-20-35	2	3	
Ky. Cons. Stone, 1st mtg. 6½'s[46]	2-20-35	13	16	
Ky. Rock Asphalt, com.	2-23-35	½	1	
Ky. Rock Asphalt, pfd.	2-23-35	3	8	
Ky. Rock Asphalt, 6½'s, 1935[47]	2-20-35	55	65	
Lawrence P. C.[49]	2-15-35	17	19	
Lawrence P. C., 5½'s, 1942[47]	2-20-25	80	85	
Lehigh P. C., com.	2-21-35	14¾	15¼	
Lehigh P. C., 7% pfd.	2-21-35	98	98	.87½ Apr. 1
Louisville Cement[47]	2-20-35	75	85	
Lyman-Richey 1st 6's, 1935[47]	2-20-35	100	102	
Marbelite Corp., com. (cement pts.)[40]	2-20-35	¼	½	
Marbelite Corp., pfd.[40]	2-20-35	4	5¼	
Marblehead Lime 6's, 1939[14]	2-21-35	40	....	
Marquette Cement, com.[47]	2-20-35	19	22	
Marquette Cement, pfd.[47]	2-20-35	85	90	
Marquette Cement Mfg. 1st 5's, 1936[47]	2-20-35	98	100	
Marquette Cement Mfg. 1st 6's, 1935[46]	2-20-35	100	102	
Material Service Corp.[47]	2-20-35	3	5	
McCrady-Rodgers, com.[47]	2-20-35	5	7	
McCrady-Rodgers, 7% pfd.[47]	2-20-35	20	25	

RECENT QUOTATIONS ON ROCK PRODUCTS SECURITIES

Stock	Date	Bid	Asked	Dividend
Medusa P. C., com.[47]	2-20-35	11	15	
Medusa P. C., pfd.[47]	2-20-35	35	40	
Michigan L. and C., com.[47]	2-20-35	65	70	
Missouri P. C.[49]	2-21-35	6¾	7½	
Monarch Cement, com.[47]	2-20-25	80	90	
Monolith P. C., com.[9]	2-20-35	2½	3½	
Monolith P. C., 8% pfd.[9]	2-20-35	6¼	7¼	
Monolith P. C., units[9]	2-20-35	15	17½	
Monolith P. C., 1st mtg. 6's[9]	2-20-35	90	100	
Monolith Portland, Midwest[9]	2-20-35	1 1/10	1½	
National Cement (Can.) 1st 7's[42]	2-22-35	100	....	
National Gypsum A., com.[47]	2-20-35	8	9	
National Gypsum, pfd.[47]	2-20-35	85	88	
National Gypsum 6's[47]	2-20-35	98	100	
National L. and S. 6½'s, 1941[47]	2-20-35	92	95	
Nazareth Cement, com.[47]	2-20-35	4	6	
Nazareth Cement, pfd.[47]	2-20-35	35	40	
Newaygo P. C., 7% cum. pfd.[49]	2-21-35	25	....	
Newaygo P. C., 1st 6½'s, 1941[46]	2-20-35	25	28	
New England Lime 6's, '35[14]	2-21-35	10	....	
N. Y. Trap Rock 1st 6's, 1946	2-23-35	56¾	actual sale	
N. Y. Trap Rock, 7% pfd.[46]	2-20-25	60	none offered	
North Amer. Cement, 1st 6½'s, 1953[47]	2-20-35	19	21	
North Amer. Cement, 6½'s, 1943[47]	2-20-35	70	73	
North Amer. Cement, 6½'s, 1940[47]	2-20-35	40	45	
North Amer. Cement, com.[47]	2-20-35	½	1	
North Amer. Cement, 7% pfd.[47]	2-20-35	1	2	
North Shore Mat. 1st 6's[47]	2-20-35	30	35	
Northwestern Port. Cem. units[9]	2-20-35	37	41	
Northwestern States P. C.[47]	2-20-35	24	28	
Ohio River S. and G., com.	2-23-35	....	3	
Ohio River S. and G., 1st pfd.	2-23-35	40	....	
Ohio River S. and G., 2nd pfd.	2-23-35	5	10	
Ohio River S. and G., 6's[46]	2-20-35	6	none offered	
Oregon P. C., com.[47]	2-20-25	7	10	
Oregon P. C., pfd.[47]	2-20-35	45	55	
Pacific Coast Agg., com.[40]	2-20-35	1⅝	1⅝	
Pacific Coast Cement, 6's, '37[40]	2-20-35	63	66	
Pacific P. C., com.[40]	2-20-35	2⅞	3¼	
Pacific P. C., pfd.[40]	2-20-35	33	36	
Pacific P. C., 6's, 1935-37[40]	2-20-35	100	101¼	
Peerless Cement, com.[47]	2-20-35	½	1	
Peerless Cement, pfd.[47]	2-20-35	3	5	
Penn.-Dixie Cement, com.	2 21-35	4⅛	4½	
Penn.-Dixie Cement, pfd.	2-21-25	21	24	
Penn.-Dixie Cement, 6's A 1941	2-21-35	79	81	
Penn. Glass Sand Corp., pfd.[47]	2-20-35	85	90	3.50 Apr. 1
Penn. Glass Sand Corp., 6's[47]	2-20-35	101	104	
Petoskey P. C., 6's, 1941[48]	2-21-25	62	....	
Petoskey P. C., 6's, 1935-38[48]	2-21-35	62	80	
Petoskey P. C., com.[48]	2-21-35	2	....	
Republic P. C., 6's, 1943[47]	2-20-35	84	88	
Riverside Cement, A[9]	2-20-35	7¼	9	
Riverside Cement, B[9]	2-20-35	¾	1	
Riverside Cement, pfd.[9]	2-20-35	90	95	
Rockland and Rockport Lime, 1st pfd.[47]	2-20-35	2	3	
Sandusky Cement 6's[47]	2-20-35	70	80	
Sandusky Cem. 6½'s, 1937[47]	2-20-35	70	80	
Santa Cruz P. C., com.[9]	2-20-35	58	....	
Schumacher Wallboard, com.[9]	2-20-35	9/10	1 2/10	
Schumacher Wallboard, pfd.[9]	2-20-35	3	4	
Signal Mt. P. C., com.[47]	2-20-25	2	3	2% div. voted Jan. 24
Signal Mt. P. C., pfd.[47]	2-20-35	18	21	$2.00 Feb. 15
Southwestern P. C., units[40]	2-20-35	175	....	
Spokane P. C. 7% cum. pfd.[49]	2-21-35	8	....	
Standard Paving & Mat. (Can.), com.[42]	2-22-35	¾	1 1/10	
Standard Paving & Mat. pfd.[42]	2-22-35	....	17	
Superior P. C., A[40]	2-20-35	33	36	
Superior P. C., B[40]	2-20-35	8	9½	
Trinity P. C., units[47]	2-20-35	10	15	
Trinity P. C., com.[47]	2-20-35	1	3	
Trinity P. C., pfd.[47]	2-20-35	10	15	
U. S. Gypsum, com.	2-21-35	44¾	45½	
U. S. Gypsum, pfd.	2-21-35	147	148	
Volunteer P. C., 1st 7's, 1942[49]	2-21-35	65	....	
Volunteer P. C., com.[49]	2-21-35	1¾	....	
Vulcanite P. C., cap.[49]	2-21-35	2½	....	
Vulcanite 7½'s, 1943[49]	2-21-35	44	....	
Wabash P. C.[47]	2-20-35	6	8	
Warner Co., ww. 1st 6's[47]	2-20-25	22	25	
Warner Co., ex. w. 1st 6's[47]	2-20-35	22	25	
Warner Co., com.[47]	2-20-35	1	2	
Warner Co., pfd.[47]	2-20-35	8	10	
Whitehall Cem. Mfg., com.[47]	2-20-35	30	35	
Whitehall Cem. Mfg., pfd.[47]	2-20-35	60	65	
Wisconsin L. & C., 1st 6's, '40[47]	2-20-35	35	45	
Wolverine P. C., com.[47]	2-20-35	1	2	
Yosemite P. C., A, com.[40]	2-20-35	1¼	1⅝	

Quotations by: [9]A. E. White Co., San Francisco, Calif. [14] The Securities Co. of Milwaukee, Inc., Milwaukee. Wis. [37]Wise, Hobbs & Seaver, Inc., Boston. [40]Martin Judge, Jr., and Co., San Francisco, Calif. [42]Nesbit, Thomson & Co., Toronto. [46]First National Bank of Chicago, Chicago, Ill. [47]Anderson Plotz and Co., Chicago, Ill. [48]Hewitt, Ladin & Co., New York, N. Y. [49]Feldman & Co., Inc., Boston, Mass.

F—Flat.

Recent Dividends Announced

Alpha Portland Cement Co., com.	$0.25	April 25, 1935
Lehigh Portland Cement Co., pfd.	.87½	April 1, 1935
Signal Mountain Portland Cement, 8% pfd.	2.00	February 15, 1935

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Arundel Corp. (sand, gravel, slag and dredging contractor), Baltimore, Md., reports for the year ended December 31, 1934, a net profit of $728,485 after depreciation, depletion, federal taxes, etc., equivalent to $1.50 a share on 483,851 no-par shares of capital stock outstanding, excluding 8705 shares held by company. In 1933 company reported income from operations less non-operating losses and adjustments, of $16,622. Balance sheet as of December 31, 1934, shows total assets of $8,125,922 comparing with $8,133,198 at end of 1933, and surplus of $2,104,527 against $1,839,272. Current assets amounted to $2,866,185 and current liabilities were $984,911 compared with $2,186,247 and $1,198,534, respectively, at close of preceding year. Cash and marketable securities totaled $1,394,072 against $1,193,876 on December 31, 1933. Joseph V. Hogan, president, told stockholders that at the beginning of this year the uncompleted contracts on company's books amounted to $7,308,995. Total construction work completed during the year amounted to $8,979,326, compared with $6,078,865 in preceding year, an increase of 48%.

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Signal Mountain Portland Cement Co., Chattanooga, Tenn.: Stockholders met January 24 and were agreeably surprised to learn they would receive a 2% dividend, the first in five years. During the year the company reported an increase in business of approximately 30 per cent, a substantial part of which was represented by large TVA orders.

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New York Trap Rock Corp., New York City, has notified holders of its $4,793,500 first mortgage 6% gold bonds, 1946, and $466,500 debenture 7% bonds, 1936, of a plan of readjustment and is requesting deposits by April 15. In regard to the first mortgage bonds, the plan proposes waiver of unpaid sinking fund installments and readjustment of sinking fund provisions so that required future payments will be based on percentage of the corporation's income each year. The same waiver is proposed for the debentures which also would be extended to December 1, 1946, and would have their status changed to that of a mortgage on the property subject only to the first mortgage. Both issues would continue to bear interest at the same rate. The debentures in addition would participate with the preferred stock in profits at the cumulative rate of 1% annually. The first mortgage bonds would be entitled to share in profits with the common stock at the cumulative rate of 1% annually. The first mortgage bonds would be entitled to share in profits with the common stock at the cumulative rate of 1% annually.

Pacific Coast Aggregates, Inc., San Francisco, Calif.: The plan of reorganization which has already received the approval of the requisite number of security holders and of the California Corporation Commission, has been confirmed in federal district court in San Francisco. The plan, formulated under the provisions of section 77-B of the National Bankruptcy Act, provides for the issuance of new $10 par common stock in exchange for present outstanding securities in the following ratios: 85%, or 120 shares for each $1,000 of first mortgage 6½% bond; 8½%, or 34 shares for each $1000 debenture; 4%, or 0.14 share for each share of preferred; 1%, or 0.025 share for each share of present common. In cancellation of a $107,978 note of indebtedness, Natomas Co. will receive 8316 shares, or 1½% of the new common.

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Peerless Portland Cement Co., Detroit, Mich., receiver's reports for the years ended December 31, show:

INCOME ACCOUNT

	1934	1933
Net cement sales	$970,467	$573,356
Cost of sales	562,137	373,508
Operating profit	408.329	199,848
Other income	9,851	1,071
Total income	418,180	200,919
Other expenses, etc.	116,473	95,965
Depreciation	237,210	237.777
Balance	64,497	(d)132,823
Interest on bonds and notes	107,051	116,162
Reserve for contingency losses	.....	298,559
Net loss	42,554	547,544

The balance sheet as of December 31, 1934, showed current assets of $625,214 and current liabilities of $733,071, of which $489,119 was incurred prior to the receivership. Current assets were increased more than $220,000 during the year 1934, and current liabilities remained about the same.

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Great Lakes Portland Cement Corp., Buffalo, N. Y., reports for the years ending December 31:

	1934	1933
Sales	$1,118,379	$1,000,109
Costs and expenses	767,306	790,265
Depreciation	266,671	275,906
Operating profit	84,402	(d)66,062
Other income	4,699	5,483
Total income	89,101	(d)60,579
Interest	32,602	34,860
Other deductions	72,013	47,590
Net loss for year	15,514	143,029
Deficit, January 1	1,175,649	1,030,016
Surplus debits	7,533	2,605
Deficit December 31	1,198,697	1,175,649
Earned per share, class A	(d)$0.34	(d)$3.18

Number of class A shares, 45,000.

The balance sheet as of December 31, 1934, shows current assets of $514,674 and current liabilities of $558,089. Current liabilities were reduced, as compared with December 31, 1933, by more than $300,000, while current assets remained about the same.

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Lawrence Portland Cement Co., New York City, reports for the year ended December 31:

	1934	1933
Net income (after taxes, depreciation, depletion, interest, etc.)	$93,626	(d)$40,930
Earned per share	$1.25	(d)$0.55

The balance sheet as of December 31, 1934, shows current assets of $1,129,240 and liabilities of $1,051,466, of which $214,291 was cash. capital of $1,051,466, of which $214,291 was

United States Gypsum Co., Chicago, Ill., reports consolidated net income for 1934 of $2,155,368 after all charges equal to $1.35 a share on 1,193,082 common excluding the 58,379 shares held in the treasury. This compares with net in 1933 of $1,738,927 or $1 a share on the 1,187,660 shares excluding the 64,161 shares then held in the treasury. On the basis of issued capital stock, including treasury shares, the 1934 earnings are equal to $1.28 a share against 9 cents a share on the same basis in 1933. The consolidated balance sheet as of December 31, 1934, shows net working capital of $18,842,831 in comparison with net working capital of $18,312,101 at the close of 1933. Current assets in the recent statement totaled $20,140,715 and current liabilities were $1,297,884 against current assets and current liabilities of $19,672,122 and $1,360,020, respectively on December 31, 1933.

During 1934, reduced holdings of United States government bonds by more than 50% and cash account absorbed the full increment from this reduction. Government bond holdings totaled $4,899,027 at the close of 1934, against $10,824,655 at the end of 1933, while cash rose to $8,156,523 from $1,464,891. Receivables showed a small decline during the year and inventories a slight gain. With 1934 dividend payments totaling $1.25 a common share and full payments on the 7% preferred covered by a small margin by earnings for the year, profit and loss surplus, which was subject to no adjustments for the period rose to $19,705,972 from $19,585,811 at the close of 1933.

Sewell L. Avery, president, in his letter to stockholders, reported expenditures for plant additions and improvements in 1934 totaling $1,849,030. In 1933 such expenditures amounted to $1,116,373.

CONSOLIDATED INCOME ACCOUNT

Years ended Dec. 31.	1934	1933
Net operating profit	$3,766,772	$3,202,885
Other income	566,806	566,955
Total	$4,333,578	$3,769,840
Loss on plant retirement, etc.	125,627	158,677
Depletion	29,662	26,195
Depreciation	1,804,525	1,749,300
Federal and Dominion income taxes	218.395	96,740
Net income	$2,155,369	$1,738,927
*Earned per share, common	$1.35	$1.00

*Based on 1,193,083 common shares, excluding 58,739 in treasury in 1934 and 1,187,660 shares, excluding 64,161 shares on treasury in 1933.

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Petoskey Portland Cement Co., Petoskey, Mich., reports for the years ended December 31:

INCOME ACCOUNT

	1934	1933
Sales	$1,167,736	$678,608
Net earnings	244,143	72,538
Depreciation and depletion	53,560	56,401
Balance	190,583	16,137
Interest, etc.	80,944	80,944
Net income	109,639	(d)64,807
Earned per share	$0.55	(d)$0.33

The balance sheet as of December 31, 1934, showed current assets of $487,610 and current liabilities of $74,503, leaving a working capital of $413,107; of current assets $103,542 was cash; $100,155, receivables; $283,913, inventory.

TRAFFIC and TRANSPORTATION

Proposed Rate Changes

THE FOLLOWING are the latest proposed changes in freight rates up to and including the week of February 23:

New England

35146. To cancel rate of 52½c net ton on **screenings, gravel,** not less than ½ in. in diameter, from Greenbush, Mass., to Bourne, Buzzards Bay and Sagamore, Mass., as published in N. H. R. R. M. D. P. U. 1507, and apply in lieu thereof mileage scale of commodity rates as indicated in M. D. P. U. 1507 (page 4).

Trunk

M-3390. Revise the rates on **phosphate rock,** C. L., from Mt. Pleasant, Tenn., and Florida mines on the S. A. L. Ry. and A. C. L. R. R., as follows:

(a) From the Mt. Pleasant, Tenn., district:

To Syracuse, N. Y., Cayuga, N. Y., Binghamton, N. Y.: Present rate—$5.14. Proposed rate—$5.26. Basis—Rochester rate.

To Canton, Penn.: Present rate—$4.94. Proposed rate—$5.26. Basis—Emporium rate.

To Ellwood Jct., Penn.: Present rate—$5.24. Proposed rate—$4.94. Basis—Baltimore rate.

To W. Bridgewater, Penn., New Castle, Penn., Ellwood City, Penn., Corliss, Penn., Neville Island, Penn., Belleview, Penn.: Present rate—$5.21. Proposed rate—$4.94. Basis—Baltimore rate.

To Niagara Falls, N. Y., Buffalo, N. Y., East Buffalo, N. Y., West Bloomfield, N. Y.: Present rate—C$9.96. Proposed rate—$9.97C. Basis—Buffalo, N. Y., rate in connection with A. C. L. R. R.

To Emporium, Penn.: Present rate—G$10.44. Proposed rate—$9.97G. Present rate C$10.44. Proposed rate—$9.96C. Basis—Buf-Proposed Buffalo rate.

To Old Forge, Penn.: Present rate—G$10.21. Proposed rate — $9.97G. Present rate — C$10.21. Proposed rate—$9.97C. Basis—Proposed Buffalo rate.

(c) From A. C. L. R. R. stations in Florida:

To Niagara Falls, N. Y.: Present rate—G$9.96. Proposed rate—$9.97G. Present rate —C$9.96. Proposed rate—$9.97C. Basis—Buffalo, N. Y., rate.

To Emporium, Penn.: Present rate G$10.44. Proposed rate — $9.97G. Present rate — C$10.44. Proposed rate—$9.96C. Basis—Buffalo, N. Y., rate.

To Old Forge, Penn.: Present rate—G$10.21. Proposed rate—$9.97G. Present rate—C$10.21. Proposed rate—$9.97C. Basis —Buffalo, N. Y., rate.

G—Good phosphate rock.

C—Crude phophate rock.

33223. **Crushed stone,** C. L. (See Note 2), from Hopatcong Junction, N. J., to the Reading Company, rates ranging from $1.10 to $1.70 per net ton.

33228. **Sand and gravel,** C. L. (See Note 2), from Hopatcong Junction, N. J., to Starlight, Preston Park, Lakewood, Poyntelle, Penn., $1.80, Orson, Pleasant Mount, Penn., $1.70, Mayfield Yard and Jermyn, Penn., $1.60 per net ton.

33244. **Sand** (other than blast, engine, fire, foundry, glass, moulding, quartz, silex or silica), in straight or mixed carloads (See Note 2), from Morrisville, Penn., to Westwood Siding, Penn., $1.40 per net ton. Present rate 17c per 100 lb., sixth class.

33260. **Sand,** described in Groups 2 and 3, P. R. R. I. C. C. 221, C. L. (See Note 2), from Mapleton District, Penn., to Port Ivory, N. Y., $2.60 per net ton. Present rate, $3.20 per net ton.

33274. **Sand,** common or building (not blast, engine, fire, foundry, glass, moulding or silica sand), and **gravel,** C. L. (See Note 2), from Stony Point, Marlboro and Newburgh, N. Y., to N. Y. C. R. R. stations, Rondout Station, Phoenicia, Edgewood, Kaaterskill, Arkville, Stamford, Bloomville, Davenport Center, Oneonta, N. Y., and various, rates ranging from 85c to $1.55 per net ton. It is also proposed to cancel the commodity rates on **sand** and **gravel,** C. L., from Jones Point, N. Y., to stations on the W. S. R. R., as published in Tariff I. C. C. W. S. No. 6345.

Central

42022. To establish on (a) **asphaltic limestone,** broken, crushed or ground (not applicable on asphaltic limestone to which asphalt has been artificially added), and (b) asphaltic limestone, broken, crushed or ground, to which asphalt has been artificially added, C. L. (See Note 3), New Vienna, O., to destinations in Official territory.

42034. To establish on **sand,** blast, core, engine, filter, fire or furnace, foundry, glass, grinding, or polishing, loam, moulding or silica, C. L., Utica, Penn., to Milwaukee, Wis., 320c per net ton.

42042. To cancel rates on **stone,** natural (other than granite, jasper, marble, onyx or bituminous rock), viz., **rubble,** in open top car equipment, minimum weight 40,000 lb., **chips or waste,** in open top car equipment, N. O. I. B. N., in Official Classification; **crushed,** in open top car equipment, N. O. I. B. N., in Official Classification, except when car is loaded to full cubical or visible capacity, actual weight will apply, published in Item 18270-A, Sup. 51, C. F. A. L. Tariff 218-I, Dell Roy and Sherrodsville, O., to Bradford (McKean Co.) and Kane, Penn., account obsolete. Classification basis to apply in lieu thereof.

42105. To establish on **stone,** crushed (in bulk), and **unburned agricultural limestone** (in bulk in open top cars), carload. Rates in cents per net ton.

To (representative points)	(1)	(2)
Witcher, W. Va.	135	155
Longacre, W. Va.	145	...
Gauley Bridge, W. Va.	145	...
Nellen, W. Va.	155	175
Rupert, W. Va.	165	185
Meadow Creek, W. Va.	175	195

(1) Proposed rate from Fultonham, Ohio.
(2) Proposed rate from West Columbus, Ohio.

42131. To establish on **sand,** except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding and silica, and **gravel,** in open top cars, carload, Massillon, O., to Macedonia, O., 80c per net ton via P. R. R. direct.

42117. To cancel rates on **sand,** viz., blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding and silica, carload, from Youngstown, O., Robinson, New Castle and Beaver, Penn., to all destinations in the states of Illinois, Indiana, Michigan, New York, Ohio, Pennsylvania and West Virgina, as published in P. & L. E. R. R. Tariff I. C. C. No. 2960. (b) To cancel rates on **sand** viz., blast, building, core, engine, filling, filter, fire, foundry, furnace, glass, grinding, loam, moulding, polishing, quartz and silica, carload, from all stations on the P. & L. E. R. R. and from all stations on the Montour R. R., P. C. & Y. Ry., and Monongahela Ry., when via the P. & L. E. R. R., to all base points and points shown in C. F. A. L. Basing Tariff No. 470, taking same rates or arbitraries higher, as published on pages 124 and 125 of P. & L. E. R. R. Tariff I. C. C. No. 3010.

42130. To establish on **sand and *gravel,** straight or mixed carloads, to Ferdinand, Ind., from Rockport, 80c, and from Tell City, Ind., 85c per ton. Route: Sou. Ry., Huntingburg, Ind., Ferdinand R. R.

*Will only apply on traffic moving in open top cars.

42182. To establish on **sand and gravel,** in open top cars, C. L., from Circleville, O. Rates in cents per net ton. Proposed rates to New Straitsville, Greendale, O., 95; Murray City, Carbon Hill, O., 90. Route: Via P. R. R., Lancaster, O., C. & O. Ry.

42185. To establish on **limestone,** ground or pulverized, in box cars, C. L., minimum weight 60,000 lb., from Gibsonburg, Maple Grove and Woodville, O., to Omar, Stirrat and Earling, W. Va., 245c per net ton. Route: Via P. R. R., Columbus, O., C. & O. Ry.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

42186. To establish specific rates on **limestone,** ground or pulverized, in box cars, C. L., minimum weight 60,000 lb., Marble Cliff and West Columbus, O., to points in Virginia, West Virginia and Kentucky on the C. & O., N. & W., N. Y. C. and Virginia Rys. Statement of proposed rates will be furnished on request.

42188. To establish on **sand,** except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding and silica, and **gravel,** in open top cars, C. L., actual weight will apply, Toledo, O., to Gibsonburg, O., 50c per net ton.

42235. To establish on **sand,** common, and **gravel,** C. L., from Massillon, O.

(Rates in cents per net ton)

To	Prop.
Carrollton, O.	60
Conotton, O.	60
Dell Roy, O.	60
East Cadiz, O.	85
East Canton, O.	40
Minerva Junction, O.	50
Mishler, O.	50
Moran, O.	80
Pawnee, O.	60
Rexford, O.	85
Robertsville, O.	50

42236. To establish on **sand and gravel,** C. L., in open top cars, C. L., from Massilon, O.

(Rates in cents per net ton)

To	Prop.
Smithville, O.	50
Big Prairie, O.	60
Rosemont, O.	80
Glenmont, O.	85
Blissfield, O.	85
Spellacy, O.	85
Champion, O.	90

42237. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica) and **gravel,** C. L., from Peru, Ind.

(Rates in cents per net ton)

To	Prop.
Dumfee, Ind.	95
Raber, Ind.	95
Peabody, Ind.	90
Arnolds, Ind.	90
South Whitley, Ind.	90
Sidney, Ind.	85
Packertown, Ind.	85
Frankfort, Ind.	75
Avery, Ind.	75
Michigantown, Ind.	70
Forest, Ind.	70
Russiaville, Ind.	65
Middletons, Ind.	65
Vermont, Ind.	65
Greentown, Ind.	65
Sycamore, Ind.	70
Sims, Ind.	70
Swayzee, Ind.	70
Herbst, Ind.	70
Roseburg, Ind.	75
Marion, Ind.	75
Hanfield, Ind.	80
Landess, Ind.	80
Van Buren, Ind.	80
Warren, Ind.	85
Buckeye, Ind.	85
Liberty Centre, Ind.	90
Craigsville, Ind.	95
Curryville, Ind.	95
Peterson, Ind.	95
Decatur, Ind.	100

Route—Via N. Y. C. & St. L. R. R. direct.

42238. To establish specific rates on **sand and gravel,** C. L., Munger, Ill., to points in Michigan, Indiana and Ohio, on basis of 5c per ton over Joliet-Plainfield, Ill., rates.

42245. To establish specific rates on **stone,** crushed (in bulk) and **limestone,** agricultural, unburned (in bulk in open top cars), C. L., Fultonham and East Fultonham, O., to points in West Virginia. Statement of present and proposed rates will be furnished on request.

42247. To cancel rates on **limestone,** ground, C. L., minimum weight 40,000 lb., unless capacity of car is less (See Note 1), Cleveland, O.

(Rates in cents per net ton)

To	Rate
Allegheny (Pittsburgh North Side), Penn.	189
Bellaire, O.	189
Bridgeport, O.	189
Butler, Penn.	227
Elm Grove, W. Va.	189
Martins Ferry, O.	189
Pittsburgh, Penn.	189
Scott Lumber Co., W. Va.	189
Wheeling, W. Va.	189

as published in B. & O. R. R. Tariff I. C. C. 22346, account obsolete. Classification basis to apply in lieu thereof.

42249. To establish specific rates on **stone,** crushed, **slag** and/or **gravel,** coated with oil, tar or asphaltum, in open top equipment, C. L., from Martins Ferry, O., to points in the states of Maryland, Ohio, Pennsylvania and West Virginia.

Southern

7443. **Limestone,** ground or pulverized, C. L. Dugan, Ky., to Richmond, Ind., Lafayette, Ind., Dundee and Grand Rapids, Mich. Louisville, Ky., combination now applies. Proposed rate on ground or pulverized limestone, C. L., minimum weight 60,000 lb. from Dugan, Ky.: To Richmond, Ind., 260; Lafayette, Ind., 280; Dundee, Mich., 330; Grand Rapids, Mich., 340c per net ton; made with relation to rates that have been approved from Dugan, Ky., to other C. F. A. destinations.

7445. **Phosphate rock,** C. L., from South Carolina points to Virginia cities and Trunk Line points. It is proposed to cancel commodity rates on phosphate rock, C. L., from and to points mentioned, as published in Agent Speiden's I. C. C. No. A-737 (Glenn's series), and to apply in lieu thereof class rates governed by Southern Classification.

7457. **Asphaltic sandstone,** processed and unprocessed, broken, crushed or ground, C. L., Bowling Green, Rockport, Big Clifty, Black Rock, Summit, Garfield and Leitchfield, Ky., to points in C. F. A. and I. F. A. territories. It is proposed to establish rates on "asphaltic sandstone, having a natural bitumen content of not in excess of five and one-half (5½) per cent" and "asphaltic limestone, having a bitumen content of not in excess of five and one-half (5½) per cent to which asphalt has been artificially added," from Kentucky producing points to points in C. F. A. and I. C. A. territories, based on the scales shown in Agent Speiden's I. C. C. 1736, under Descriptions A and B, respectively, grouping the origins and applying the joint line scales for the average distance when to destinations located in excess of 150 miles from the nearest producing point.

7461. Cancellation. **Stone, viz., calcite,** ground, C. L., from Cartersville, Ga., to Montreal, Que., New Toronto and Toronto, Ont. It is proposed to cancel commodity rates on stone, viz., calcite, ground, C. L., from and to points mentioned, as published in S. F. T. B. Port and Interior Points Tariff, I. C. C. A-737 (Glenn's series), and to apply combination rates in lieu thereof.

7540. **Phosphate rock,** not acidulated (acid phosphate) nor ammoniated, and **limestone, phosphatic,** C. L., Centreville, Aetna, Bon Aqua, Columbia, Eastern, Harsh Switch, Hohenwald, North Riverside, Twomey and Perryville, Tenn., to LaGrange and Newnan, Ga. It is proposed to reduce the rates on phosphate rock and limestone, phosphatic, etc., C. L., from N. C. & St. L. Ry. Groups 1 and 2 points, as shown in N. C. & St. L. Ry.'s I. C. C. 3323-A to LaGrange and Newnan, Ga. The proposed rate to LaGrange and Newnan is 332c from Group 1 points and 362c per net ton from Group 2 points.

7560. **Stone,** broken or crushed, C. L., Balsam, N. C., to Hays and Chester, Penn. Class rates now apply. Proposed rates on stone, broken or crushed, C. L., in open top cars (See Note 3), from Balsam, N. C., to Chester, Penn., 420c; Hays, Penn., 460c per net ton.

7604. **Phosphatic sand or clay** (fertilizer filler), ground or not ground, C. L., from L. & N. R. R. stations in the Tennessee phosphate field to points in Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, Virginia and West Virginia, named in S. F. T. B. Southern Rate Basis, I. C. C. A-725 (Glenn's series). It is proposed to establish rates on phosphatic sand or clay, C. L., from L. & N. R. R. stations in the Tennessee phosphate field (copy of exhibit showing origins involved will be furnished upon request) to destinations mentioned above, based on scales 1, 2 and 3, as shown page 12, section 2, of S. F. T. B. Phosphatic Sand or Clay Tariff I. C. C. 1852. Publication to be made by extending the application of these mileage scales to cover the involved origins and destinations. If a need for specific rates later develops, specific point to point rates, based on the scale for the Docket 13494 class rate distance to be published to actual and potential consuming points.

I. C. C. Decisions

15679. **Lime.** By division 2. Parties to Jones' I. C. C. No. 2453, authorized, in fourth section order No. 11792, to establish rates on lime from and to points in central territory on basis of a weight of 50,000 lb. equal to 80 per cent of scale prescribed in Eastern Lime Manufacturers' Traffic Bureau vs. A. & B. B., 112 I. C. C. 7.

4051. **Crushed Stone and Crushed Stone Screenings.** By division 5. A finding of non-justification has been made as to a rate of 80c a ton on crushed stone and crushed stone screenings from Bluffton, Ind., to Fernald, Ohio, a distance of about 124 miles. The rate proposed to be reduced was $1.33. The reduced rate was to apply over the New York, Chicago & St. Louis and the Chesapeake & Ohio.

Cement

Pennsylvania-Dixie Cement Corp., New York City, Blaine S. Smith, president, has 4-pp. article in the February issue of the *Manufacturer's Record* on the cement industry in the South, in which he emphasizes the possibilities of concrete in home building and in architecture.

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Mildred, Kan.: It was recently reported that legal steps are in process tending toward the resumption of control by Wm. Volker of Kansas City, Mo., of the cement plant at Mildred Kan., which he successfully operated a number of years ago.

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Crushed Stone

Danville, Va., was recently considering leasing its municipal stone quarry to the Luck Construction Co., Richmond, Va. The city has been unable to operate it to advantage, and about $15,000 would be necessary for repairing machinery.

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Wahl Construction Co., Corning, Iowa, was recently awarded the contract for hard surfacing several blocks in the north part of town with crushed rock. The price was $1.60 per cubic yd. for an estimated 850 cubic yd., and the contract called for completion before May 1.

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Mechanicsburg, Ohio: The addition of ½ ounce per day of finely ground limestone to the roughage fed ewes as lambing time approaches has been found to supply sufficient calcium for the needs of the lambs to be born, according to D. Bell in charge of sheep experiments at the Ohio Experiment Station.

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Charlotte, N. C.: Bidding was opened recently on the Carolina Crushed Stone 23-acre bankruptcy holdings in the south of the city.

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Minnesota Mining and Manufacturing Co., St. Paul, Minn., recently announced that excavations have started for an additional storage unit at its Wausau, Wis., plant, which will represent an expenditure of $200,000. Mr. Hatch, manager of the plant, said that the company is considering the erection of other buildings to take care of its increasing business.

Jasper Stone Co., Weeping Water, Neb., opened operations January 10, putting 30 men to work. The superintendent said that 20 additional men will be employed immediately, and that work will continue as long as weather permits.

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Union Traction Co., Coffeyville, Kan., announced the leasing of the stone quarry and crushing plant north of Lenapah to the recently-formed Peerless Stone Co. on January 1. The new company will specialize in furnishing state and federal highway specification stone.

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Nebraska City, Neb.: Prospects of winter work on the Missouri river channel improvement projects were minimized December 26, when quarrymen notified contractors that they would be unable to make deliveries. According to a ruling of the U. S. engineers, truckers hauling rock from quarries must be paid NRA wages, nearly double their present wage. Saying the code wages could not be met without undue risk of loss, quarrymen appealed to Washington seeking a compromise. The Tobin Quarries, which supplies the contractors in this area, asked to be able to rent trucks to the men at $3.00 a day, and then pay 40c an hour. The code was 60c an hour. Until result of this appeal has been made known, the company closed its quarries.

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Caldwell Stone Co., Inc., Danville, Ky., was recently completing a crushed stone plant to have 500 tons capacity. Crushers, screens, elevators and shovel were being installed by Roy C. Whayne Supply Co., Louisville, Ky.; Traylor Eng. and Mfg. Co., Allentown, Penn.; and Northwest Shovel Co., Green Bay, Wis.

Rock Asphalt

An asphalt rock quarry, located on 960 acres of tribal lands owned jointly by the Chickasaw and Choctaw tribes in southeastern Oklahoma, was to be leased for 15 years to the highest bidder at an oil, gas and asphalt lease sale held at Muskogee, Okla., December 27, under the auspices of the Five Civilized Tribes Agency. Tribal attorneys announced that a minimum royalty on crude asphalt had been set at 15c per ton, and that the minimum tonnage set for the first year was 10,000 tons. An advance royalty of $500 is required.

Slag

Standard Slag Co., Youngstown, Ohio, has leased the old site of the Riverside, Wheeling, W. Va. Twenty-five men will be employed in construction, which, it is said, will exceed $40,000. The company will use slag as their principal product and will also handle a line of converted by-products.

Lime Producers' Forum

Conducted by Victor J. Azbe,
Consulting Engineer, St. Louis, Mo.

Heat Loss Calculations and Value of Lime Kiln Insulation

EXTENT of heat loss from vertical kiln walls is ordinarily not appreciated, but by a study of the following tabulations one comes to realize the rather great degrees of heat waste on this account and the value of insulation.

There are two methods of calculating heat loss value through walls from a lime kiln. In both cases the amount of heat lost as determined is the same, but the monetary value is different. In one case it is assumed that all heat lost from the hot zone would be utilized in converting $CaCO_3$ to CaO, to which only heat of high elevation is applicable. In the other case heat loss is assumed to be more average without any special value. The calculation results are presented in the following tabulations:

TABLE I.—HEAT LOSS, B.T.U. PER SQ. FT. PER HOUR

Amount of Insulation	Brick Wall Thickness 18″	22½″
Wall Without Insulation	687	560
Wall With 2″ Insulation	364	323
Wall With 3″ Insulation	297	269
Wall With 4″ Insulation	250	230
Wall With 5″ Insulation	217	200
Wall With 6″ Insulation	192	180

Surface exposed is the equivalent of about 800 sq. ft., consisting only of the hot zone, having an elevation of about 19 ft. and a shell circumference of 42 ft. Internal average temperature, as existing in the hot zone, was assumed to be 2000° F.

TABLE II.—HEAT LOSS IN MILLIONS B.T.U. PER DAY AND PER 300-DAY YEAR.

Amount of Insulation	18″—Wall Thickness—22½″ Day	Year	Day	Year
Wall With No Insulation	12.19	3657	9.94	2892 B.t.u.
Wall With 2″ Insulation	6.45	1935	5.72	1716 B.t.u.
Wall With 3″ Insulation	5.27	1581	4.78	1324 B.t.u.
Wall With 4″ Insulation	4.43	1339	4.08	1224 B.t.u.
Wall With 5″ Insulation	3.85	1155	3.55	1065 B.t.u.
Wall With 6″ Insulation	3.40	1020	3.19	957 B.t.u.

It is assumed that all heat lost from the hot zone is heat of high elevation, that all would be utilized and that each 1378 B.t.u. would produce a pound of lime.

TABLE III.—HEAT LOSS EQUIVALENT IN TONS OF LIME PER YEAR AND DAY.

Amount of Insulation	18″—Wall Thickness—22½″ Day	Year	Day	Year
Wall With No Insulation	4.78	1334	3.90	1170
Wall With 2″ Insulation	2.5	750	2.25	675
Wall With 3″ Insulation	2.06	615	1.87	561
Wall With 4″ Insulation	1.74	512	1.60	480
Wall With 5″ Insulation	1.51	453	1.39	417
Wall With 6″ Insulattion	1.33	399	1.25	375

When no special value is given to the heat of higher elevation cost from the hot zone, its value is assumed as just 20c per million B.t.u. which is the cost of heat in the gas as purchased. One year = 300 operating days.

TABLE IV.—HEAT LOSS IN DOLLARS PER YEAR AND PER TWENTY YEARS.

Amount of Insulation	18″—Wall Thickness—22½″ 1 Year	20 Years	1 Year	20 Years
Wall With No Insulation	$280.00	$5616.00	$229.00	$4580.00
Wall with 2″ Insulation	146.00	2920.00	134.00	2680.00
Wall With 3″ Insulation	120.00	2400.00	110.00	2200.00
Wall With 4″ Insulation	102.00	2040.00	93.00	1860.00
Wall With 5″ Insulation	87.00	1740.00	81.00	1620.00
Wall With 6″ Insulation	77.00	1540.00	12.00	1440.00

TABLE V.—HEAT LOSS IN DOLLARS PER YEAR AND TWENTY YEARS. A MORE CORRECT ASSUMPTION.

Amount of Insulation	18″—Wall Thickness—22½″ 1 Year	20 Years	1 Year	20 Years
Wall With No Insulation	1334.00	26,680.00	1170.00	23,400.00
Wall With 2″ Insulation	750.00	15,000.00	675.00	13,500.00
Wall With 3″ Insulation	615.00	12,300.00	561.00	11,220.00
Wall With 4″ Insulation	512.00	10,240.00	480.00	9,600.00
Wall With 5″ Insulation	453.00	9,060.00	417.00	8,240.00
Wall With 6″ Insulation	399.00	7,980.00	375.00	7,500.00

As it is unreasonable not to give heat of high elevation a special value, in Table V. such value is given. The loss is calculated by taking the heat loss equivalent in tons of lime in Table III, multiplying by 5000, which is a common good rate of natural gas consumption per ton of lime, and again by the cost of gas, which is 20 cents per thousand cubic ft.

TABLE VI.—OPERATING AND OVERHEAD LOSS DUE TO WALL HEAT LEAKAGE.

Amount of Insulation	18″—Wall Thickness—22½″ 1 Year	20 Years	1 Year	20 Years
Wall With No Insulation	408.00	9560.00	390.00	7800.00
Wall With 2″ Insulation	250.00	5000.00	225.00	4500.00
Wall With 3″ Insulation	206.00	4120.00	187.00	3740.00
Wall With 4″ Insulation	174.00	3480.00	160.00	3200.00
Wall With 5″ Insulation	151.00	3020.00	139.00	2780.00
Wall With 6″ Insulation	133.00	2660.00	125.00	2500.00

The calculation of overhead loss is most difficult to evaluate, but certainly a kiln makes less lime when uninsulated and so investment overhead is increased, kiln labor also increases, as do also kiln repairs. Not desiring to enter the subject in too complex a manner and still take account of the items, the best approach would be to assume that 10% of investment per ton of lime is negatived each year. Investment is likely about $1000.00 per ton, so loss is $100.00 per year for each ton loss in capacity per day, on which basis the table above was calculated.

Cost of Insulation

The cost of Block Insulation is 30 cents less 42% per sq. ft. per inch thickness. This makes the cost of various thicknesses be:

	Per Sq. Ft.	Per 800 Sq. Ft.
Thickness 2″	$ .348	$278.40
Thickness 3″	.522	417.60
Thickness 4″	.696	556.80
Thickness 5″	.870	696.00
Thickness 6″	1.044	835.20

Cost Compared to Fire Brick and Expansion Consideration

Cost of Block Insulation is $2.10 per cu. ft., while compared to it fire brick at $50.00 per thousand would cost $0.85 per cu. ft. Therefore, the additional cost of insulation is $1.25 per cubic feet.

In addition it must be remembered that insulating material is not used only for insulation, but also to take care of expansion, and as such is even more necessary than for the apparent main purpose.

TABLE VII.—COMBINED FUEL, OPERATING AND OVERHEAD LOSS.

	18″—Wall Thickness—		22½″	
Amount of Insulation	1 Year	20 Years	1 Year	20 Years
Wall With No Insulation	1628.00	32,560.00	1400.00	28,000.00
Wall With 2″ Insulation	900.00	18,000.00	810.00	16,200.00
Wall With 3″ Insulation	730.00	14,600.00	673.00	13,460.00
Wall With 4″ Insulation	617.00	12,340.00	575.00	11,500.00
Wall With 5″ Insulation	543.00	10,860.00	500.00	10,000.00
Wall With 6″ Insulation	478.00	9,560.00	450.00	9,000.00

In the above table, items in Table V were added to these in Table VI. From this total loss a sum equal to one-ninth was deducted. This deduction was made for the reason, that if insulating material is not used, the space is filled with fire brick, which has an insulating value one-ninth that of insulating block.

Conclusion

From the various tabulations presented it becomes apparent that insulation is quite valuable and that one should use as much as he can. The limitations in a certain kiln are the kiln external dimensions, its internal dimensions, the required fire brick wall thickness, the internal temperature and the intrinsic value of heat at the various points.

It appears that the hot zone should be insulated to the greatest extent. As 4 inches is the maximum that can be applied in the case considered, this thickness is used for a distance of 20 ft. upwards from the burners.

Above the hot zone and to the main gas offtake, temperature is less and value of heat is also less, being heat of low elevation available only for preheating of stone, so insulation thickness used is only 2″ which is necessary anyway to guard the shell against expansion of kiln lining.

Above the main gas offtake no insulation is used as none is necessary from either expansion or heat conservation standpoints.

Below the burners, 4″ insulation is used throughout the cooler. In the upper zone this amount is used because temperatures are fairly high and the value of heat considerable, while below this the same thickness is used to guard the concrete against excessive heat in case the cooler may be operated hot. Also, while in the upper kiln regions the fire brick used is secondhand, in the cooler new brick would be used throughout, so the cost of insulation is considerably reduced, The 85c per cubic ft. fire brick cost is eliminated wherever the $2.10 per cubic ft. insulating brick is applied.

Lime

Western Lime Works, Ste. Genevieve, Mo., has terminated a sales agreement it has had for many years with the Ste. Genevieve Lime and Quarry Co., whereby the latter company sold all its output, and will now market its product directly. Sidney P. Armsby, formerly with the National Lime Association and subsequently with the Dittlinger Lime Co., and the Haden Lime Co., both of Texas, has been made technical director of the Western Lime Works.

Cement

Statistics: The portland cement industry in January, 1935, produced 3,202,000 bbl., shipped 2,846,000 bbl. from the mills, and had in stock at the end of the month 21,816,000 bbl. Production and shipments showed decreases of 15.3 and 24.7%, respectively, as compared with January, 1934. Stocks at mills were 11.6% higher than a year ago. The factory value of the shipments from the mills in 1934—75,917,000 barrels—is estimated as $115,771,000—an average of approximately 1.52 per bbl. The statistics here given are compiled from reports for January, received by the Bureau of Mines, from all manufacturing plants except one, for which an estimate has been included in lieu of actual returns. In the following statement of relation of production to capacity, the total output of finished cement is compared with the estimated capacity of 162 plants at the close of January, 1935, and of 163 plants at the close of January, 1934.

RATIO (PER CENT) OF PRODUCTION TO CAPACITY

	Jan., 1934	Jan., 1935	Dec., 1934	Nov., 1934	Oct., 1934
The month	16.6	14.1	19.5	26.2	29.3
The 12 mos. ended	23.9	28.8	29.0	28.7	28.3

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The organization and operation of **International Cement Corp.,** New York, N. Y., are described in the March issue of *Fortune.*

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Miscellaneous

Thompson-Weinman Co., Inc., Cartersville, Ga., announced that they are shipping 1000 tons of barytes to Trinidad in South America early in February, to be used in the drilling of oil wells.

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Canadian Johns-Manville Co., Ltd., was to open a rock wool plant in Asbestos, Quebec, in February, which will be among the first rock wool manufacturing operations in Canada.

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Detroit Graphite Co., Detroit, Mich. was sold recently to a debenture holding protective committee at Wilmington, Del.

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Miami Chat Co., Miami, Okla., won recognition for the distinctive features of its miniature property exhibit at the recent Southwestern Lumbermen's Association at Kansas City, Mo. This concern is boosting the use of 11 different products, including dust, roofing chat, railroad ballast, crushed rock, blasting sand, sawing sand, blow sand and paving sand.

Uses of most of these products may be seen in the accompanying picture of the company's exhibit. An oil road, with stabilized road mix; concrete slab, with dust or fresh asphalt; bituminous base mix and other roads are illustrated weaving through the display. On the silo top to the right of the barn is roofing chat, while the fence posts enclosing the barnyard are of concrete. The foundations of the house and garage are of concrete, as are the portals of the tunnels.

A small stream, shown in the exhibit, has rip-rapped banks to show the advantage of guarding against soil erosion. Ballast is used on the little railroad tracks, while the small train in the foreground was actually operated at the exhibit with the conveyor to the left loading the cars with products. The company, through its research work, has found many uses for the chat, which in the past have not been developed.

Exhibit of uses of rock products

Digest of Foreign Literature

By F. O. Anderegg, Ph. D.
Consulting Specialist, Long Island City, N. Y.

Calcium Hydro-silicates—A Contribution of the Theory of the Hardening of the Silicate Cements. The first part of this comprehensive record by Prof. Hans Kühl and Alexander Mann was reported last month (Rock Products (1935) No. 1, p. 34) with the chief results graphically shown. The amount of lime in the solution in equilibrium with calcium hydro-silicates rises rapidly on passing from monocalcium composition to that for a tri-di ratio, at which point the lime solution reaches saturation. Beyond this, the curve flattens off; the higher hydro-silicates, requiring supersaturated solution for equilibrium, are, therefore, unstable. This means that, in portland cement, the first hydrolysis product is a hydrated tricalcium disilicate. When this compound is brought into contact with leaching water, lime is more or less slowly removed until an equal molar ratio is reached. Before that, the curve flattens off. The extremely low rate of diffusion of lime, which may require months with particles of the order of 50 to 100 microns under the most favorable circumstances, means that, in ordinary properly prepared concrete, the approach to even the unimolecular ratio may require tens and probably hundreds of years, depending on conditions. *Tonindustrie Zeitung* (1934) **58,** No. 81, p. 990; No. 82, p. 1003; No. 83, p. 1014.

The Latest Development in Concrete for Subsistence Housing. A. Weiss suggests, for the present economic situation in Germany, which demands maximum use of local labor and minimum expenditure of money, and which needs more housing, that light weight concretes are quite suitable. Using light weight aggregate cemented together with one of the gas containing cements such as aerocrete, Iporite, etc., sufficient compressive strength is secured to carry the building load with only 80 to 120 lb. of cement per cubic yard of concrete. Then an outer finish of asbestos-cement shingles is sufficient to make the house completely weather-resistant. Such concrete is also regarded as suitable for barn and silo construction. *Zement* (1934) **23,** No. 40, p. 591.

The Measurement of the Water Combined in Lime Putty, with a "Dielcometer." In the study of the causes underlying the yields obtained from different limes on slaking, W. Wawihl has employed an organic liquid, dioxan, which is miscible with water and has followed the reaction by means of an apparatus developed by Prof. Ebert for rapid determination of dielectric constants, called "dielcometer." As the constant of the organic is 2.2 as compared with 80 for water, sensitive distinctions are readily obtained. Working with a nearly pure calcium lime, which had a yield of about 5 cu. ft. of putty from 100 lb. quick lime, he first determined its behavior over sulfuric acid of different concentrations. With 50% acid, having a vapor pressure of 6.5 mm., about 4% of the original water not in chemical combination failed to evaporate, although a higher concentration acid was able to extract it.

A 0.5-g. sample was shaken with 25 ml. of dioxan and in 10 min. the solid precipitated rapidly. The supernatant liquid was withdrawn and placed in the measuring apparatus. In 10 min. 96% of the free water was extracted and in 40 all was removed from the lime. Here also a light residue seems to be held a little more firmly.

In experimenting with putty made from dry hydrate, the 50% sulfuric acid rapidly removed practically all the water and the dioxan extracted practically all in 10 min. (Comment: It would be of great interest to make similar determinations with some of our dolomitic limes and compared with their "water retaining capacity.") *Tonindustrie Zeitung* (1934) **58,** No. 47, p. 561.

New Ways to Burn Lime. Erich Schirm discusses ways and means of burning fine grained limestone in apparatus costing little more than the shaft kiln. The coal requirement should be no greater than that of the shaft kiln and the labor and repairs should be kept to a low figure. Some sort of chain grate suggests itself and two ways of using it have been tried. In the first, the fuel and stone are mixed and charged on to the grate, the former is ignited and air is drawn through to promote combustion. This requires a considerable installation. In the other method, the stone only is placed on the grate, the fuel is burned outside of the layer and then drawn or pushed through it. Each method has its own limitations. Provision should be made to burn stone sizes varying from little larger than dust up to about two inches.

In one apparatus, the flame is drawn down through a bed of solid in three layers on a traveling grate. The bottom layer consists of calcined stone, the second of the finest stone, and on top comes the coarser stone. The bottom layer protects the grate and its thickness can be varied with the flame temperature. When the combustion air is preheated by coming in contact with the calcined stone, greater efficiency is secured, and, in that case, some unburned stone may be mixed with the bottom layer. In actual practice, the temperature seems to decrease along the bed uniformly from the decarbonation temperature near the flame. But then comes danger of overburning, so that the upper limit of the flame temperature must be rigidly controlled. Also, the tendency for the upper portions of the stone to be calcined first must be controlled and, hence, the multilayered feed.

For best results, it seems to be desirable to have a uniform temperature along the kiln which may be secured by sending the fuel in through a variety of ports the whole length of the kiln. In order to secure complete combustion, it is necessary to provide space on either side which will vary in accordance to the length of flame of the particular fuel. Blowing in the fuel at pressures above atmospheric results in considerable turbulence and more effective combustion. *Tonindustrie Zeitung* (1934) **58,** No. 88, p. 1069; No. 89, p. 1081.

An Exact Temperature of 100° C. with the Wet Process. Dil. Ing. Schrim discusses the problem of a more complete extraction of the heat from waste gases from a cement kiln without interfering with its capacity. An analysis of the problem is given and some of the present day systems are described and their limitations are pointed out. The best of the systems that have been proposed is a "mixing current" system, where the slurry runs on top of a perforated drum and through the holes into the drum which is partly filled with 4 inch steel heat interchange bodies. The drum is placed so that the waste gases must pass through it. It rotates about a horizontal axis. As the slurry dries out the powder falls through and goes on down the kiln to be burned. It is claimed that a very rapid heat interchange takes place and the gases are cooled to the boiling point of the water. To prevent dust formation it is recommended that the raw mix be not completely dried in the drum, having a water content of 12 to 15 per cent when it falls out. If it is desired to increase the capacity of a given kiln it would be necessary to increase the the volume of heat interchange, or to lose heat in the waste gases. *Cement and Cement Manufacture* (1934), **7,** No. 2, p. 29.

Standard Methods of Testing Cement and Concrete. At the request of the British Ministry of Health and the London County Council a committee has drawn up a new code of regulations for reinforced concrete. Specifications are given for organic impurities in sand, decantation test for sand and fine aggregates, sieve analysis of aggregates, concrete consistency and compressive strengths which are quite similar to the A. S. T. M. tests, except that 6-inch cubes are used for compression test. *Cement and Cement Manufacture* (1934), **7,** No. 4, p. 106.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Three Associations Hold Annual Conventions in New York

Hundreds of Producers Attend N.C.C.P.A., N.C.M.A., and American Concrete Institute Meetings from February 14 to 21

TECHNICAL TRENDS in concrete construction were detailed and summarized from various angles at a series of meetings in New York, N. Y., beginning February 14 at Hotel Astor when the National Cinder Concrete Products Association convened. On February 18 and 19, the National Concrete Masonry Association met at Hotel Pennsylvania, and these sessions were followed by those of the American Concrete Institute, February 19 to 21.

Much of the discussion at each of the conventions revolved about the increasing use of concrete units in current and projected construction work stimulated by the Federal Housing Administration.

Code affairs were discussed at the first two meetings, and President Einar Christensen of N.C.C.P.A. proposed a merger of his association with N.C.M.A. Members of both organizations are operating under the same code.

N.C.C.P.A. Meeting

THE ELEVENTH annual meeting of the National Cinder Concrete Products Association was held on February 14, 15 and 16. Total attendance was 79, including manufacturers of cinder units from all parts of the country, as well as makers of concrete masonry in general.

Chas. F. Conn, president of the Giant Portland Cement Co., opened the convention and stressed the importance of association efforts in obtaining full advantage of the federal housing program.

Speaking as a Republican, Mr. Conn referred to the National Housing Act as "the cleverest thing that has come out of Washington." Specific discussion of the act itself was begun by D. R. Collins of the Portland Cement Association, who outlined the provisions of Title II of the National Housing Act, designed to stimulate new home construction. He also referred to Title III which provides the set-up of mortgage associations to finance home construction. Mr. Collins emphasized the fact that this housing legislation represents "the biggesst opportunity we've ever had" in connection with reducing the national home shortage of over 1,000,000 dwellings at the present time. He reasoned that the maximum amount and maturity on home loans may best be obtained when the borrower offers a permanent type of structure such as concrete units provide, as security.

"The insured mortgage," said Mr. Collins in describing National Housing Act provisions, "can cover up to 80% of the appraised valuation of a dwelling and represent a face amount up to $16,000 and must have a maturity not to exceed 20 years. . . . Let us assume that Mr. Jones desires to purchase a $5000 home. He may secure a mortgage for an amount up to 80% of $5000, so he puts down $1000 cash and obtains a mortgage for $4000. This mortgage he repays in equal monthly installments. *All the indebtedness on the home—taxes, insurance, and the like—is included in one mortgage.* There is no expense in second mortgage, no renewals, and no standing charges once the mortgage is granted. . . . Already a thousand financial institutions with an equal number of branches throughout the country are ready to lend money on these secured mortgages. Already the Federal Housing Administration is making commitments for insurance. The drive to provide homes and raise the standards of home ownership is beginning to get under way."

T. E. Damm of the Federal Housing Administration, Washington, D. C., appeared next on the program to review the provisions of Title I of the National Housing Act, which provides for three-year loans up to $2000, for residential improvements. He stressed the importance of the concrete products manufacturer being aggressive in promoting local modernization campaigns. Subsequent discussion revolved around multiple applications of cinder concrete units for new basements under frame houses, veneering, garage-additions, etc.

Arthur R. Rule, New Jersey real estate developer who recently has registered the name "Cinderella Cottage" as a trade-mark for his all-cinder-unit houses, related his successful experiences with cinder units in various housing projects. He offered the suggestion that the greatest problem before the industry now is one of merchandising because the technical perfection of cinder units has been established.

President Einar Christensen, who presided at all convention sessions, emphasized the fact that the fundamental qualities of cinder concrete products—strength and fire resistance—had been proved to the point where additional discussion seemed trivial except in certain instances. He pointed out the architectural effect possible with painted cinder unit walls and their efficiency and economy in achieving desirable acoustics. He also mentioned the insulative qualities of cinder units and their flexibility in manufacture to serve the purpose of the architect. These characteristics, he said, plus the long-established quality of being nailable, are the advantages that competitive clay products do not have and cannot get.

J. S. Vaughn of Louisville, Ky., discussed in detail preparation for, and application of, paint on cinder units.

He discussed applications with brush and spray gun, exteriors and inside surfaces, pigments and coloring. The ensuing discussion showed the tremendous stride that has been made by the industry in developing painted walls, first originated by one of its member plants in Detroit.

H. V. Hopton, of Nashville, Tenn., a maker of cinder units as well as a plastering contractor, presented the plasterers' point of view. While recognizing the value of painted walls, of which he has quite a few to his credit, notably in the Tennessee Valley Authority development at Norris, he urged that the cinder unit industry maintain friendly relations with the plastering trade, remembering that plastered walls will continue to be the main market and that it is important to get across to the contractor the particular values of cinder units, the nailability for grounds, the straight wall, etc.

The Secretary of Code Authority, Horace W. Bush, led the next session on "The Code and the Industry." The administrator of the Code, Col. Beverly Ober stated the points of view of the administration, supplemented by other members of the NRA, making it clear that the administration stands back of any sincere effort on behalf of industry for self government. President Christensen, at the final session, pointed out that increased activity in business undoubtedly would bring about establishment of new cinder unit plants, and that it was of the utmost importance to guide these plants into making a good cinder unit.

Specifications

He reported on what the association has done—more particularly what has been done by the service division of the association in furnishing sales and manufacturing service. Of particular importance was a manufacturers' specification for cinders which is now being developed.

In closing, the chairman introduced the eight members of Code Authority who were all present, and suggested the idea of joining the cinder unit association with the general concrete masonry association. W. D. M. Allan of the Portland Cement Association, Dan Servey, manufacturer of Haydite units, of Kansas City, Mo., Benjamin Wilk, president of the N.C.M.A., Austin Crabbs of Davenport, Iowa, member of Code Authority, spoke on the subject, and it was decided that an effort should be made by the executive committee of the association to develop such a program in cooperation with the National Concrete Masonry Association.

Present officers were continued. Secretary H. H. Longenecker was in charge of convention entertainment which included a banquet, luncheons and a conducted tour through New York City's largest and newest building project, Rockefeller Center, architectural composition which involved use of 88,000 tons of cement and 25,000 tons of limestone.

N.C.M.A. Convention

A NUMBER of producers who attended the convention of the National Cinder Concrete Products Association remained in New York, N. Y., February 18 and 19 for sessions of the National Concrete Masonry Association. Some of the discussion as to the housing program and the code, duplicated material presented (see preceding report of N.C.C.P.A. convention) the week before.

"Considering the country as a whole," said Benjamin Wilk in his report as president, "we can say definitely that the concrete products industry has grown up. It has passed through its infancy and adolescent stages and now reveals itself to the construction world as a well-developed and mature industry.

"Leading architects throughout the United States such as Albert Kahn and Eliel Saarinen of Detroit, have specified concrete units for a number of the buildings in which they are interested. Theatres have been built using concrete units not only from a structural, but also from a decorative and acoustical standpoint. The United States government, through the TVA and the Subsistence Homestead Division, has specified concrete units on a number of housing projects. The largest cities in the country through their building codes have recognized concrete units as a desirable masonry product. The federal government in its specifications, as well as the American Concrete Institute, and the American Society for Testing Materials through their standard specifications, acknowledge the structural value of concrete units.

"Then, to cap our achievements, we find that our competitors, the clay brick people, in many instances are putting in departments for the manufacture of concrete block.

"The (concrete block) basement business we have anyway—but now we must go hard after the additional above-ground business that can be ours if we band together in a strong association to push the decorative and acoustical properties as well as the structural properties of concrete units. We have learned a great deal about concrete units for partitions, back-up, ashlar exposed interior and exterior walls. We are learning how to obtain decorative effects by applying paint to masonry walls. We are realizing that our units have unusual acoustical value. These we may call our 'plus' advantages."

Code Reactions

Reports on code operation offered at the convention varied from those of Pennsylvania producers who said the code was helpful in sustaining fair-price levels, to the reactions of New York state members who believed the filed-price provision of the code in particular was penalizing honest concrete products manufacturers who stuck by their filed prices. Austin Crabbs, Iowa member of the code authority, declared the code wasn't working because enough effort had not been put into making it popular and voluntary.

In rebuttal, Horace W. Bush, code authority chairman, said that the difficulty was one of educating the industry, and that funds were lacking for that purpose. He cited 10 or 12 instances, however, of the code authority's success in getting sizable government contracts rescinded in cases where concrete products plants involved were not complying with the code. He favored turning back up to 50% of code assessment collections to local producers for local enforcement.

Col. Beverly Ober, of NRA, advised members to notify state NRA compliance directors of code violations on the part of competitors. In some cases, he said, prosecution expense would be paid by NRA.

Chairman Brookes of the code authority's complaint committee emphasized that most complaints were in the "hearsay" class, and were backed up by no well grounded facts. F. J. Patchell was introduced to the convention as the new NRA administration member of the code authority.

C. Everett Burbank, of Bedford Hills, N. Y., delivered one of the feature technical papers on "Why Every Home Builder Is a Prospect for a Concrete Floor." Based on his company's experience with both poured concrete and concrete-joist-and-slab floors, he emphasized that the trend was decidedly toward the latter type.

"With an article as new to the public as the precast concrete joist is," he said, "cost must in most cases be spoken of in comparative terms. We have found it to compare favorably with all other fireproof floors and in most cases a substantial saving can be shown. When compared with wood joist construction, we have found that in a few cases they are equal. However, in general the concrete joist first floor will add from ½% to 2% to the cost of the house, and for second floor work, slightly more.

Financing

"Another item which ties in closely with cost is the matter of financing. We recently made a survey of a number of bankers in our locality and found that without exception they were in favor of the fireproof first floor as good security for a loan."

D. R. Collins and an FHA representative presented to the N.C.M.A. convention addresses on "Concrete Masonry Homes—the Answer to Long-Term Financing" and "What the Federal Housing Administration is Doing to Stimulate Your Market." This material, along the line of that previously discussed with cinder concrete unit producers, was followed by L. N. Whitcraft's description of an advertising campaign that developed prospects for 5000 concrete houses. Another Portland Cement Association representative, W. G. Kaiser, manager of the Cement Products Bureau, used slides to illustrate why concrete masonry is increasing in importance in the sound and heat insulation field.

Louis Gelbman, of Yonkers, N. Y., reviewed the production and merchandising of concrete ashlar. President Wilk, referring to his paper on "High Early Strength Cements in Concrete Products Manufacture," on the program of the American Concrete Institute (see following report), discussed ths subject further from the angle of dollars-and-cents economy.

High Early Savings

"The Detroit tests," (reported to A. C. I. by Mr. Wilk) he said, "indicate that there is a strength advantage of 21% at 28 days in favor of 70 lb. of high early strength cement, as compared with 94 lb. of ordinary portland cement. Our experience indicates that the products manufacturer can save 20% of his cost by using high early strength cement.

"Generally, the price of high strength cement is 50c per barrel higher than the price of ordinary portland cement. Generally, high early strength cement is marketed in paper bags, whereas the up-to-date products manufacturer usually purchases in cloth bags. The differential in favor of cloth bags over

paper bags is generally 15c per barrel. Assuming a market price of $1.75 per barrel net for cement in cloth, after the sacks have been returned, the price for the high early strength cement would be $1.75 plus 50c plus 15c or $2.40. On this basis 70 lb. of high early strength cement costs practically the same as 94 lb., or one sack of ordinary portland cement."

American Concrete Institute Convention

FIRST MEETINGS of the three-day, 31st annual convention of the A. C. I. were on February 19 when eight papers were read and discussed at day and evening sessions. Co-authors of the opening address on "Properties of Mortars and Concretes Containing Portland-Puzzolan Cements" were Raymond E. Davis, H. E. Davis, J. W. Kelly and G. E. Troxwell of the University of California, who outlined their investigation of blended cements with reference to 17 blending materials, 6 portland cements and 82 blended cements. Being a progress report, no final conclusions were set forth, but most significant of the 14 different properties discussed (as developed by the tests) included grindability of cement, tensile and compressive strength of standard mortar, compressive strength of plastic mortar and concretes and volume changes of mortar.

Hydraulic Cements

The marked trend away from use of one standard type of cement for all construction projects was emphasized by P. H. Bates, chief of the clay and silicate products division, National Bureau of Standards, U. S. Department of Commerce. In a paper entitled "Trends in the Production and Use of Various Types of Hydraulic Cements," he pointed out that consumers, in particular, are demanding more types and more varieties within any one type of cement to meet the requirements of special construction projects.

Thus, there is the standard portland cement used in the majority of cases, as covered by the present Federal and American Society for Testing Materials specifications; low-heat-of-hardening cements, such as are being used for Boulder Dam; portland cement to resist sea water and other waters containing destructive salts; and the high early strength cements used by almost every State highway department and many municipalities, he stated.

The increasing use of these cements will, according to Mr. Bates, result in better concrete. The project on which the cement is to be used must be carefully studied to determine whether a saving will result from the employment of a special cement which will cost more than standard portland cement but which may speed up construction or make possible a lighter structure.

He pointed out that it is not to be supposed that all producers will make all the varieties of cement which seem likely to be in demand. "If any manufacturer can continue to make standard portland cement and dispose of it at a rate and a price that will yield him adequate continued returns on his investment, he should bend his efforts to continue in that advantageous position," he said.

"But, if he is assured that the continued demand for another type of cement or a different grade of portland cement will justify his making it, and in so doing he can obtain a satisfactory return on the needed additional investment to produce it, he would be foolish not to take advantage of the opportunity.

"Likewise, it is not to be supposed that the use of special cements will result in 100 per cent success in all cases. Not even nature can make any great masses of perfect rock. All our deposits of building stones yield a quota of material that can not be used for structural purposes.

"It must be remembered also that special cements require special handling. Cements having decided advantages along some lines are not so good in other respects. For instance, designers who are inclined to use not only the high alumina cements but also the very rapid hardening portland cements should beware of large masses of concrete unless they use artificial means of cooling. The various types of hydraulic cements are here and here to stay."

Conclusions as to the economy of "High Early Strength Cements in Concrete Products Manufacture," by Benjamin Wilk, are summarized in the preceding N. C. M. A. convention report. His address was followed by that of Inge Lyse, of Lehigh University, whose data detailed variations in concrete performance with 13 brands of standard portland cements and five high early strength cements.

Election

Lieutenant Commander Ben Moreell, Washington, D. C., of the Civil Engineer Corps, U. S. Navy, was elected director of the Institute for the fourth district, and E. Viens, Ottawa, Ont., director of the first (Canadian and northeastern) district. Officers, including President P. H. Bates and Secretary-Treasurer Harvey Whipple, were re-elected.

Discussion of the Institute's future convention schedule led to a proposal, now being further considered by the Board of Direction, to hold two regular meetings a year. Knoxville, Tenn., was named as a possibility for the next convention.

Housing was the general subject of four papers read at an evening session well attended by local architects and builders, as well as by Institute members. Subjects of R. R. Zipprodt, R. E. Copeland and W. G. Kaiser, all of the Portland Cement Association, were: "Recent Noteworthy Developments in Concrete's Use in Housing Construction," "Structural and Economic Studies of Monolithic Walls for Dwellings," and "Recent Developments in Precast Joists for Residence Floor construction." Various types of concrete unit structures were reviewed by Mr. Zipprodt as applicable to fireproof apartment and home construction at low cost. Ease of operation as well as cost, was a factor in Mr. Copeland's discussion of University of Illinois building studies. Experiences of three producers of precast concrete joists were included in Mr. Kaiser's symposium. There are now 100 concrete joist manufacturers, and he predicted a doubling of this number during 1935.

"The majority of the 100 plants," he said, "have made their first installations. A number of them have built from 10 to 20 floors each." Quoting J. W. Warren, of the Southern Cast Stone Co., Knoxville, Tenn., who has co-operated with TVA engineers and architects in developing low-cost home designs, Mr. Kaiser noted that I-shaped joists and 30″x30″x2″ slabs had been developed as the standard units. In some instances hard wood floors have been nailed (through tar paper) to cinder slabs. Features of the mold-vibrated TVA units are mortar grooves in top of joists, concave edges for slabs and lugs to facilitate steel placing on concave edges.

Mosaic Concrete

John J. Earley, architectural sculptor of Washington, D. C., described mosaic concrete to the Institute as "a new architectural medium." Dismissing the idea of an all-concrete house as impracticable, Mr. Earley described the model mosaic home built in Colesville Pike, suburb of Washington, D. C. Foundation and walls only are of concrete, walls being formed of 32 loose-jointed 2-in. slabs (cast in 9′ x 10′ molds) erected in free attachment to the reinforced concrete skeleton.

Both vibration and application of absorptive material, but not pressure application, are utilized in controlling moisture in the slab units without disturbing the granular composition. Surface of the molded units is brushed and diluted muriatic acid applied to bring out full color brilliance.

Wants Improved Cement

"In the studio," said Mr. Earley, "our control of concrete (by controlling water and the aggregates) reveals the characteristics of different cements. Our experience in the fabrication of thin slabs for small houses indicates that the highest perfection of the product and the fullest economy of the new manufacturing methods will be reached only when cement has ben perfected for this purpose. We think that the size of the particles of cement and aggregate should fit into a general theme for the gradation of the mass and that the constituent characteristics of the cement should be modified to offer better control of the time of set."

Several of the more technical papers presented before the convention, including those by Lieutenant Commander Ben Moreell and L. F. Fairchild, and the symposium on "Vibration of Concrete" will be reviewed in an early issue of Rock Products.

Mining Engineers to Include Industrial Minerals Division

Decision Made at Annual Meeting of American Institute of Mining and Metallurgical Engineers at New York

By a Special Correspondent

STRONG SENTIMENT was expressed at the annual New York meeting of the American Institute of Mining and Metallurgical Engineers, February 18-21, in favor of the creation of a new division of the Institute, devoted to technical problems of nonmetallic mineral industries. The Committee on Nonmetallic Minerals, which has arranged interesting and instructive programs for past meetings, definitely recommended to the Board of Directors that a new division to be known as the Industrial Minerals Division be authorized. Consummation of this proposal will broaden the work of the Institute on nonmetals.

The name "Industrial Minerals Division" was proposed after a lively discussion during which it was pointed out that the negative implication of the term "nonmetals" should be avoided if possible. L. H. Cole aptly summarized the situation by stating that it is far less objectionable to call a man a heathen than a non-Christian, and that in Canada the term "industrial minerals" is used interchangeably with "nonmetals" without confusion.

It was reported informally that the Board of Directors favored the creation of the new division, and during their regular meeting committees were appointed to make a thorough investigation of the situation. Success of the enlarged work of the new division depends to a great extent upon the ability of the Institute to inaugurate a program which will be of interest to stone and sand and gravel producers, a large group now only sparingly represented among Institute members.

Volume on Nonmetals Planned

At the meeting of the Committee on Nonmetallic Minerals, Chairman S. H. Dolbear reported that funds are to be made available for the publication of a volume covering the nonmetals. Although no definite plan of presentation has been prepared it is hoped that this book may be designed for inclusion in college curricula to fill a need for instruction on problems of industrial minerals.

Canadian Gypsum Industry

The Monday afternoon session arranged by the Committee on Nonmetallic Minerals was in charge of Chairman S. H. Dolbear. Recent trends in the gypsum industry in Canada were summarized by L. H. Cole of the Department of Mines. He stated that "the year 1934 saw a decided turn for the better" and that steady improvement was noticeable in all branches of the industry.

He commented further that: "In many ways the depression has been a blessing in disguise to the gypsum industry; during the years from 1926 to 1930, demand increased so rapidly that companies were forced to expand and often new apparatus and machinery were placed in operation regardless of expense, or plants already existing were taxed to their limit and forced to keep running with the minimum amount of repairs. The depression, therefore, has really given the industry what might be called a breathing spell, in which it has had time to take stock of its position, to reduce its costs of production, to devote more serious attention to the quality of its products, and to consolidate its operations into a smooth working whole, which as conditions improve will enable it to meet the demands of the trade with more varied products of a quality hitherto unattained."

During the discussion of the paper Mr. Cole mentioned that anhydrite plasters are used in England but not in Canada as yet. Experimentally, however, anhydrite plaster has been mixed with gypsum to speed the set of the material.

Flotation of Limestone

B. L. Miller of Lehigh University and C. H. Breerwood of the Valley Forge Cement Company presented a report of the work of the Valley Forge Company on flotation processing of limestone.*

The authors summarized the experiments as follows: "The examples of limestones of various kinds seem to warrant the belief that the process now in use at the Valley Forge Cement Company's plant is applicable to practically any type of limestone in which quartz, mica and iron oxides exist. Other noncalcareous minerals present in objectionable quantities probably can be removed with equal ease.

"Limestone that is poorly adapted for cement because of low lime content or improper ratios of silica, alumina and iron may be corrected. Some of the products removed may be returned to the mix in the desired proportions or the requisite amounts of clay, iron ore or silica from other sources can be added. It seems possible, by proper processing, for a cement company to make from the same type of quarry rock not only the ordinary portland cement but practically all the special kinds of cements, with only minor amounts of foreign material, if any, for special correction. A number of formulas have been worked out to show how it is possible to make proper blends of concentrates and fine slurry for special cements, but these are omitted from this paper. Any cement chemist can readily devise combinations for the different grades of cement.

"Because froth flotation for limestone processing started in the cement industry, the examples cited have all been taken from that branch of industry. It seems probable that most other types of limestone can be purified in the same general manner. Experiments are under way for the improvement of limestone for the chemical industry by the almost complete removal of all impurities. Results achieved are encouraging but not yet conclusive. If the process is successful it will be welcomed by the various companies that manufacture chemicals.

Advantages of Limestone Processing

"Several advantages of limestone processing have been suggested in the preceding discussion. These may now be summarized. Naturally, some of these apply to certain operations only.

1. *Quarrying costs reduced.* In many limestone quarries there are poor ledges or spots where the stone, for some reason, is ill adapted for the purpose required. In some instances this poor stone is quarried and thrown away at considerable expense or the quarry is worked in an awkward and inefficient way in order to leave the poor stone untouched. Obviously, the utilization of this inferior stone after processing will effect quarry economies.

2. *Limestone hitherto unavailable becomes usable.* In the efforts of all manufacturers to make their products in proximity to their markets, it seems possible that some limestone areas not now utilized may be developed.

3. *Costs of grinding raw rock reduced.* In the grinding of limestone for cement it is recognized that the presence of coarse quartz and, to a lesser degree, mica and iron oxides materially increases grinding costs. The elimination of these by froth flotation facilitates grinding.

4. *Saving of coal.* If an excess of silica or coarse mica exists in the slurry, more heat in the kiln is necessary to produce the desired chemical combinations. Actual practice at the Valley Forge Company's plant shows saving of coal when using processed slurries.

*Rock Products, August, 1934, pp. 32-7; January 15, 1935, pp. 69-72.

5. *Costs of clinker grinding reduced.* Frequently coarse particles of quartz pass through the kiln unchanged. If this happens, the costs of clinker grinding is increased, whereas the removal of these from the slurry is advantageous.

6. *Available supplies of limestone increased.* Many lime and cement companies possess limited supplies of usable stone. The processing of poorer stone may greatly prolong the life of such operations.

7. *Elimination of high-grade limestone purchases.* Many of the cement plants throughout the Lehigh Valley, as well as elsewhere, are compelled to purchase high-grade limestone from other sections to produce the proper mix. In some cases the amount purchased and shipped to the plant has run as high as 30 per cent. In some instances, this cost has become prohibitive. It seems probable that proper treatment of the quarry stone might have saved these plants by making unnecessary the purchase of stone from other sections.

8. *Improvement of the quality of cement.* The processing of limestone has permitted the introduction of materials into the kiln in the form most readily combinable at the normal heat. The resulting cement shows less uncombined lime and silica and possesses greater ultimate strength as well as higher early strength.

9. *Enables a company to produce different products.* The processing of limestone and later blending by the addition of the necessary materials permits a cement company to manufacture from the rock of a single quarry various types of cement as demanded.

10. *Sale of materials separated from the limestone.* Although it may seem visionary at the present time, the possibility of marketing some of the rejects is worthy of mention. Several uses for some of these products have been suggested.

Disadvantages of Limestone Processing

"Naturally, there are some arguments that may be advanced in opposition to the installation and operation of a limestone processing plant. These are briefly summarized.

1. *Cost of plant.* The cost of a limestone processing plant must be considered, because it requires an extra expenditure for equipment. So many factors enter into the costs, and these vary so widely because of specific requirements, that it is useless to offer any figures. It may be said, however, that the first costs are moderate.

2. *Cost of operation.* The costs of operation, involving labor, reagents, upkeep, interest on expenditure, depreciation, etc., will vary with almost every establishment, so that at present no figures can be cited. The Valley Forge Cement Co. has demonstrated the practicability of processing its stone, in that the decreased quarry, fuel, grinding and burning costs have more than offset the costs of operation of the plant. In addition, a higher grade of cement has been produced. With increased experience, the operation costs probably will be reduced substantially.

3. *Value of stone discarded.* As shown on a preceding page, the processing thus far done has resulted in the discarding of some useful material. This is not great but should not be entirely overlooked. The Valley Forge Cement Co. has found that the tonnage of $CaCO_3$ wasted in the rejects is decidedly less than the low-grade quarry rock that previously was discarded.

Credits Versus Debits

"The authors are convinced that the advantages far exceed the disadvantages, but it remains for each concern to evaluate properly both the credits and debits. Every limestone concern possesses its own problems, which demand individual examination and treatment. Each installation, to be most efficient, will require certain minor modifications of the practice described in this paper, but it is felt that these variations will be only slight and that the fundamentals described are sound and usable in practically every plant.

"No mention has been made of the processing of limestone for use in a dry-process cement plant. This is under investigation but has not yet been perfected."

In reply to a question of Mr. Dolbear, Mr. Breerwood explained that the fine material was not floated because the primary object is to raise lime content by extracting quartz and mica. This is accomplished by eliminating only the coarser particles, the fine quartz and mica presenting no difficulties during burning. Furthermore, the coarse material floats more readily, although straight slurry can be floated, that is, slurry containing 85 per cent minus 200-mesh particles. Normally about 50 per cent of the kiln feed is floated, the net result being to raise the calcium carbonate content from 70 to 76 per cent.

In reply to an inquiry it was pointed out that only minor beneficiation would result from hydroseparation without accompanying flotation, and further that much carbonate would be lost in the process.

Mechanical Preparation

Presenting a summary of mechanical preparation of nonmetallic minerals, Paul M. Tyler of the Bureau of Mines outlined some of the economic factors influencing preparation of industrial minerals as contrasted with metals. He explained that the inherent physical qualities of nonmetals are of utmost importance and that the field of beneficiation is limited; for example, a marble slab once fractured cannot be reclaimed. Consumer acceptance may be impeded by buying habits; potters accustomed to using clay from a specific source rarely can be prevailed upon to experiment with a different material. For most nonmetallic minerals there is no recognized market or price such as are common to the metals. Producers of industrial minerals usually are completely integrated, carrying on both quarrying (or mining) and fabricating (or processing) of the product. Markets for nonmetals frequently are local and temporary, requiring therefore the services of a portable plant. These economic considerations commonly are not recognized by ore dressers in making comparisons between problems of the metals and nonmetals industries.

W. M. Weigel's presentation of salt mining along the Gulf Coast, and a Bureau of Mines motion picture on sulphur completed the Monday afternoon session.

Geophysical Exploration for Sand and Gravel

Oliver Bowles acted as chairman of a program Tuesday afternoon devoted to geophysical exploration for nonmetallics. Among the papers was a most interesting presentation by S. W. Wilcox, who outlined work done in Minnesota where earth-resistivity methods have been used widely in locating commercial sand and gravel deposits. During 1934, he stated, 80 surveys were made in 20 counties in Minnesota at a cost of about $130 a deposit or approximately $0.003 per cubic yard of material located.

Geophysical surveys mapped the practical working limits of deposits and were followed by screen test crews who, in practically every instance, proved that the geophysical findings were correct. By geophysics the entire deposit commonly could be mapped in less time than it would take to bore one auger hole.

The method primarily serves qualitatively to locate sand and gravel of adequate thickness and extent for commercial utilization. By the use of only two test holes for correlation, however, quantitative checks also are possible and the thickness of overburden determined. No means of differentiating between gravel and sand has been developed, but material suitable for fill is readily distinguished from deposits high in clay or loam.

R. A. Smith, State Geologist of Michigan, called attention to a method developed in Michigan where, by means of high pressure jets, holes are drilled with remarkable rapidity. He reported a record of 13 feet in 47 seconds. The primary purpose has been to procure water to fight forest fires, but with modification samples of the drillings might be recovered. He ventured that a combination of geophysics and this method of boring might result in rapid and economical location of sand and gravel deposits.

M. K. Hubbert gave an interesting progress report of geophysical surveys in the fluorspar district of Illinois and Kentucky where the strata are highly faulted.

Developments in the Potash Industry

An all-day meeting Wednesday concluded the program on nonmetals. Oliver Bowles was in charge of the morning session and W. M. Weigel occupied the chair in the

afternoon. After reading by title a paper on South American diamond mining by V. E. Oppenheim, Dr. Bowles introduced G. W. Bain who discussed marble mining in Vermont.

H. I. Smith of the U. S. Geological Survey then summarized new developments in the potash industry. He reported that the productive capacity of the United States is now 1,000,000 tons annually with immense reserves, making the country entirely independent of foreign supplies.

Mr. Smith stated that: "The United States is still in a sense dependent on Germany, because the intense foreign competition to supply the great American market has caused world prices to be cut to just about the lowest price quoted by the most favorably situated German mines.

"In 1932 this country was potentially free from further dependence on German potash resources. Now, however, the United States may be forced to drop from third to fifth place as a potash producing nation by reason of its inability to duplicate the low labor costs in those countries, its own unrestricted admission of potash imports free of duty and its own exclusion from the principal foreign markets by the duties, quotas or embargoes involved.

"The addition of larger and larger quantities of potash to the soil appears necessary in the future and the need of research and the dissemination of information leading to a more extended use of American potash is very evident."

R. S. Dean of the Bureau of Mines reported significant developments in the concentration of potash ores by tabling and flotation in saturated brines. The conclusions are summarized as follows:

"By maintaining a closed circuit of brine saturated with the constituents of the ore, the sylvinite ores of Carlsbad, N. Mex., may be concentrated by ore-dressing methods. Any one of three procedures will yield high-grade concentrates and high recoveries: Table concentration supplemented by flotation, tabling an agglomerated feed supplemented by flotation, and all-flotation.

"Plain gravity concentration on tables yielded concentrates assaying 82.7 per cent of KCl with a recovery of 69.8 per cent. When the fines were treated by flotation the final concentrates were 84.9 per cent KCl, and the recovery was 97.3 per cent KCl. The other two methods gave higher-grade concentrates and recoveries equally as good. The methods will work also with other potassium salts."

Horace M. Albright added a few words to the discussion of the economic situation. He called attention to existing over-production although so far domestic producers are supplying less than half the annual consumption of potash. High freight rates and high labor are responsible. He compared the labor rate of $5.85 a day in New Mexico with $1.00 in Spain, $1.35 in France, and $2.00 in Germany. Furthermore, foreign potash is shipped as ballast at $3-5 a ton as compared with a freight plus water rate from New Mexico of $6-12 a ton. He stressed the need for inaugurating a conservation policy for our potash reserves but in combination with provisions to insure domestic producers a market for their product.

Industrial Minerals in California

W. W. Bradley, State Mineralogist of California, reported developments in industrial minerals production during 1934. He stated that the mineral production of California was highly diversified, as many as 55 to 60 different minerals in an average year being produced, including 30 or more industrial minerals. He reported the opening of two new deposits of barite during the year; shipments of fluorspar in California for the first time since 1918; production of a small quantity of graphite; considerable activity in the iodine plants of Santa Barbara County; interest in a pyrophyllite deposits; opening of a new talc deposit; commercial production of sulphur; and investigation of wollastonite for the production of mineral wool by an electric arc process.

Research in Illinois

M. M. Leighton, State Geologist of Illinois, reported progress in research problems of nonmetals in Illinois. Among the results was the discovery of a deposit of material approaching the properties of commercial fuller's earth. Raw materials for the production of lightweight burned clay aggregates are being studied.

A report on raw materials and the economic situation in rock wool manufacture has resulted in the construction of a plant near Chicago. Extensive field studies have located numerous deposits of sand and gravel suitable for aggregates. Commercial possibilities of utilizing Illinois tripoli in pottery are being investigated. Decolorization of silica is one of the current laboratory problems. Chemical research to develop new uses for fluorspar is being conducted.

Work in mineral economics has accompanied field work and laboratory research. The entire program is directed toward improved and increased utilization of the mineral resources of Illinois.

Illinois Woolrocks

In the absence of J. E. Lamar, Mr. Leighton presented the results of the work of his Survey on raw materials for rock wool.

"Rocks containing 20 to 30 per cent carbon dioxide have been found to be generally of proper chemical composition for manufacture of rock wool. Within this carbon dioxide range, two types of consolidated rock deposits are found in Illinois: (1) deposits of a single kind of impure rock such as cherty dolomite or argillaceous limestone, and (2) deposits of interbedded strata of diverse nature, as inter-stratified limestone and shale. Deposits of the first type are known to be used commercially. Engineering research is required to evaluate the commercial possibilities of the second type. Unconsolidated rocks falling within the requisite carbon dioxide range include chiefly the minus 4-mesh portions of glacial gravels, some glacial tills, and rarely glacial silts. The satisfactory use of these materials for making rock wool depends primarily on the development of suitable processes and equipment."

J. R. Thoenen of the Bureau of Mines presented a suggested classification of surface mining methods. Papers on refractories, magnesite, strontium, and rock asphalt also were scheduled. Unfortunately, W. A. Janssen was unable to be present to summarize effects of NRA codes on nonmetallic mineral industries.

Portland Cement Pavement Yardage

AWARDS of concrete pavement for January, 1935, were announced by the Portland cement Association as follows:

	Sq. yd. awarded during January, 1935	Total sq. yd. for year to date, Feb. 2, 1935
Roads	2,355,576	2,355,576
Streets	911,922	911,922
Alleys	3,835	3,835
	3,271,333	3,271,333

Cement Products

Consolidated Rock Products Co., Los Angeles, Calif., has issued an interesting bulletin designed to promote the use of ready-mixed concrete. After a historical and descriptive introduction and a list of some of the principal users, there is a data sheet for calculating cement mixtures for quantities of ingredients and strength requirements and a blank estimate sheet for computing the cost of concrete mixed on the job. This sheet contains 39 items of cost in connection with mixing the concrete and 10 items of cost for placing the concrete. The object of course is to emphasize many items of cost to the contractor, who mixes his own concrete, which he is very apt to overlook.

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Magnesite

Northwest Magnesite Co., Chewelah, Wash., was recently building a fourth kiln in order to take care of orders. E. Garber, general manager, stated that orders in December were exceptionally heavy with a result that all stock was depleted. According to Mr. Garber, a large order of magnesite was received from a mill in Alabama which had not had a shipment since 1929.

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Lime

Durable Cement: Lime mixed with turtle oil or whale oil formed the cement with which the fortifications of St. George's, Bermuda, were once made. They are still standing in good condition after 300 years.

A Fabricated Conveyor Flight Which Is Proving Its Worth

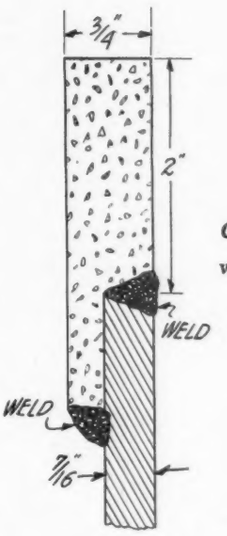
By Miles C. Smith*

DURING the past several months, considerable interest has been centered upon the test of a screw conveyor with fabricated flights which is being conducted at the California plant of the Monolith Portland Cement Co.

These flights, which were designed by Conveyor Co., Inc., Los Angeles, Calif., to provide the wear resistance of manganese-steel flights without the expense of such construction, are fabricated of mild steel, with a manganese-steel ribbon welded on to form the outer edge. And, while the test has not progressed far enough yet to obtain any definite figures on the ultimate life of these fabricated flights, several months of service indicate that much of the claim made for them will prove true.

An 18-in. conveyor, handling clinker, was selected as having a sufficiently severe service to make a fair test, and, while all the flights were of fabricated construction at the start, it was soon found that the end flights should be replaced with full manganese castings. The fabricated ones, however, have proved quite satisfactory for all intermediate positions, and indications thus far seem to prove that the new type flights will serve from three to four times longer than mild steel flights in these intermediate positions.

Relatively simple in construction, these fabricated conveyor flights depend for their success upon the successful welding of manganese steel to mild blue annealed steel sheet. As the accompanying sketch shows, the ¾-in. manganese ribbon joins with and is attached to the 7/16-in. mild steel by two welds. One weld is a pure and simple strength weld of butted material, while the other is a fillet weld, run along the corner and for which there is no special preparation.



Cross-section of weld on conveyor flight ribbon

In selecting materials to be used in this fabrication, the Conveyor Co., Inc., selected "Stroco" flux-plated manganese electrodes, manufactured by Rich Manufacturing Co., Ltd., Los Angeles, and made the welds electrically. A "V" was provided for the butt weld, but the unusual penetration and amalgamation with both manganese steel and mild steel of the weld metal provided sufficient anchorage at the fillet weld. After these several months of use, there is no indication whatsoever that trouble may be expected in so far as the welds are concerned.

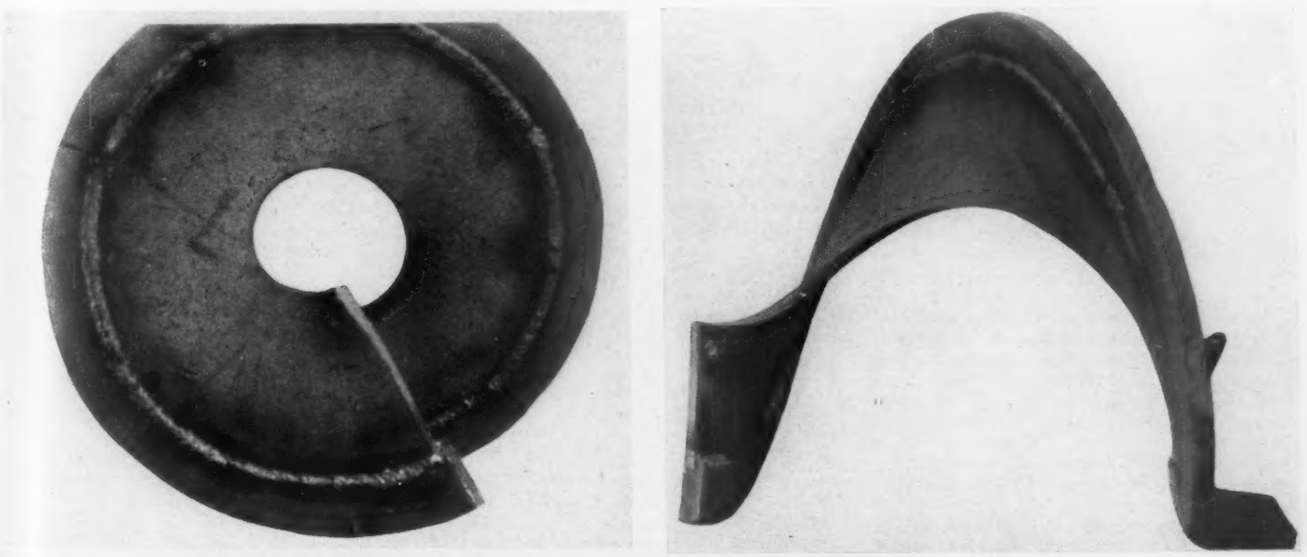
Although many types of construction might have been adopted in the building of these fabricated flights, the Conveyor Co. engineers reasoned that an 18-in. conveyor in which the flights of the screw have become worn to a diameter of 14 in. should be useless for further service. Consequently, they have designed their manganese ribbons to have a width of 2 in. on the carrying side of the screw and give them a full thickness of ¾ in. to provide sufficient body for crushing the clinker that may become lodged at the side of the screw.

Naturally, it is a little early yet to state definitely how many manganese ribbons will be outworn by a single mild steel core. However, Conveyor Co. engineers, basing their decision upon years of experience in the construction and installation of conveying equipment, feel that at least two and perhaps three renewals will be possible. Particularly so, since the conveyor construction adopted by this company incorporates improved wear resistant bearings and gudgeons.

*Sales manager, Welding Division, Rich Manufacturing Co., Ltd., Los Angeles, Calif.

Talc and Soapstone

B. C. Sloan, Cartersville, Ga., has developed a new talc deposit near Murphy, N. C. Talc was first discovered on the property in 1920, in what is known as the Nancy Jordan Gap, of a quality and kind greatly in demand at that time for electrical manufacturing purposes. The vein was on top of the ground and after two car loads were mined and shipped, the vein "pinched out," as the miners call it. Since then thousands of dollars have been spent in prospecting and sinking shafts in an effort to relocate the vein, but it was never found until a few days ago when Mr. Sloan sunk the shaft which resulted in the discovery.



Flight conveyor with welded lip of manganese steel on mild blue annealed steel ribbon

Recent Silicosis References

(Contributed)

BECAUSE of widespread interest throughout this industry in silicosis and health hazards related to dusty occupations, ROCK PRODUCTS presents a reference list of recent articles dealing with various aspects of the subject, selected from what the contributor considers authoritative sources.

According to the consensus of opinion expressed, industries which offer no considerable exposure to finely divided quartz or silica (particles under 10 microns) need have no fear of actual silicosis. As silicosis is the only disabling type of pneumonoconiosis to which rock products workers (other than asbestos workers) are exposed, so far as present medical science is aware, freedom from silicosis means that no dusty lung disability of any description can be present, that is not present in almost any walk in life. These and other fundamental facts about silicosis and what has recently become the "dusty lung disease racket" are brought out in the following references:

REFERENCE DATA ON SILICOSIS

(FOR CONVENIENCE AND BREVITY, REFERENCES ARE GIVEN AS FOLLOWS: TITLE OF ARTICLE; AUTHOR; PUBLICATION; VOLUME AND PAGE NUMBER; YEAR.)

Effect of dust on lungs; report of Committee on Silicosis, American Public Health Association. American Journal Public Health, 20:368-379, 1930.

Report of a committee on silicosis under the headings: Occurrence. Age incidence and influence of length of employment in the dusty trades; etiology; physiological aspects.

The relation of dust to infection. E. H. Kettle. Proceedings Royal Society of Medicine, 24: 79-94, 1930.

Highly technical paper, illustrated and discussing in detail the effect of silica on the lung. Questions theory that adulterant dust has any effect. Effect of silica on pulmonary T. B. Action still doubtful. Describes numerous experiments.

Dust and pulmonary disease. A. E. Russell. Journal American Medical Association, 95: 1714-1717, 1930.

Clearly stated article to indicate excessive rates of respiratory diseases among workers in dusty trades. T. B. nearly always complicating factor. Petrographic analysis valuable in deciding effect of dust—cites chemical analysis cement dust shows 15.2% silica, petrographic analysis shows only 1% free silica.

Danger of delayed development of pneumoconiosis. J. A. Britton and J. R. Head. Monthly Laboratory Review, 33:99-100, 1931. Abstracted from Journal American Medical Association, June 6, 1931. "Pneumoconiosis" by J. A. Britton and J. R. Head (2146).

Report of four cases of silicosis which developed many years after exposures which were relatively short. Exposures of 4 months, 2 years, 4 years, 10 years. Concludes that during course of short exposures there may be sufficient dust deposited in lungs to set up progressive fibrosis which does not produce symptoms until after many years. Men in dusty work do not develop symptoms until after many years of exposure.

Industrial pneumoconioses; abstracts of nine lectures given at a meeting of industrial physicians in Bochum, Germany, May 4-7, 1929. Journal Industrial Hygiene, 13:11-15, 1931, Supp.

(Pneumoconioses and Tuberculosis in dusted lungs. Jotten.) Effect of silica lessened if lime is present. Agrees with American authors on physical properties of dust, size, etc. Discusses pathology, diagnosis and lack of therapy.

(The legal establishment of stone dust disease. V. Reichmann.) Diagnosis for compensation purposes should be made by experts only.

(Dusted lungs and tuberculosis. A. Bohme.) Discusses two opinions (1) all mild and severe changes in anatomic structure (lungs) are due to tuberculosis; and (2) severe destruction of lung tissue can be brought about by silica alone. Author accepts latter opinion. Discusses difficulties of differential diagnosis. Mortality rate from T. B. among workers with dusted lungs seems distinctly higher than among other workers.

The International Silicosis Conference held at Johannesburg, August, 1930. C. Badham. Journal Industrial Hygiene, 13:169, 1931.

A brief review of the discussion with comments on conclusions of various committees which were *accepted by the conference.*

Clinical aspects of silicosis. C. L. Sutherland. Tubercle, 13:110-114, 1931.

Author is Chief Medical Officer, National Medical Board for silicosis (England). Not usual to find fatal cases silicosis below age of 35 years. Most industries, exposure to silica dust is ten to fifteen years or longer. Diagnosis rests largely on radiographic examination. No compensation allowed in Great Britain till this is done. States definite standard must be adopted for diagnosis of T. B. Employes in England must be suspended from work when T. B. is discovered.

The dust content of the atmosphere in various dusty industries. J. J. Bloomfield. Transactions, National Safety Council, 21st Anniversary Safety Congress, 1:53-57, 1932.

Discusses harmful properties of various dusts, need of determination of numeralogical composition by chemical and petrographical analysis. Table shows quartz content of industrial dusts and average dust counts in certain dusty trades. Explains methods of dust particle counts and importance of size of particles.

Occupations and respiratory diseases. A. E. Russell, Southern Medical Journal, 25:919-927, 1932.

Article illustrated with diagrammatic drawings and X-ray photos. Discussion of chemistry of dust, concentration, effects of exposure, diagnosis of silicosis, tuberculosis, complication, pathology and mortality.

Chart shows number of cases of T. B. and pneumonia per 1000 men in granite cutting, gold mining, anthracite coal, iron and steel industry, cement plant, general manufacture. Cement is 5th in both diseases.

Effect of cement dust upon workers. A. E. Russell, American Journal of Medical Science, 185-330-338, 1933.

Discussion of quantitative dust content of air in cement plants, composition of dust, disability from respiratory diseases with seasonal fluctuations, with data to indicate cement dust does not cause or reactivate T. B. in cement mill workers.

Dust in industry; the economic and hygienic aspects of silicosis. A. E. Russell. Mechanical Engineering, 55:163-166, 1933.

Similar to other papers by same author. Concludes silicosis invariably complicated by T. B. Latent T. B. usually activated after exposure to siliceous dusts. Great increase in death rate from T. B. among workers in dusty trades contrary to trend of general population. Illustrated with charts on relative mortality from T. B. in different occupations, etc.

Roentgenologic aspect of pneumoconiosis and its differential diagnosis. H. K. Pancoast and E. P. Pendergrass. Journal of American Medical Association, 101:587-591, 1933.

Highly technical, illustrated paper with thorough discussion of X-ray diagnosis and interpretation of findings. Raises question when condition really beginning, etc.

Effects of certain silicate dusts on the lungs. W. C. Dreesen, Journal Industrial Hygiene, 15: 66-78, 1933.

Technical study with following conclusions: 1. The silicate dusts of tremolite talc and slate induce a fine, diffuse bilateral fibrosis of the lungs which is definitely demonstrable in X-ray.

2. While dusty conditions prevail in these two stone trades, resultant pneumoconiosis has not led to disability. Important in showing tendency to disprove theory of free silica as only cause of silicosis.

Silicon dioxide content of lungs in health and disease. W. D. McNally, Journal American Medical Association, 101:584-587, 1933.

Technical discussion of research studies on silicon dioxide content of lung with description of author's experiments and conclusion. Normal lung contains 1.13 mg. of silicon dioxide (silica) per gram of dried tissue. Anything over 2 grams indicates undue exposure to dusty atmosphere.

Silicosis and silicotuberculosis. L. C. Boisliniere, Journal of Missouri Medical Association, 30: 309-316, 1933.

Explanation of silicosis with scientific discussion of effect of certain dust particles and their action on the lung. Diagnostic requirements for positive identification. Evaluation of impairment.

Pathology of so-called "acute" silicosis. L. U. Gardner, American Journal Public Health, 23: 1240-1249, 1933.

Report of a study of 15 cases of so-called "acute" silicosis. Chemical analysis showed lungs contained appreciably more nodules but definitely smaller than usual silicosis case. 11 were positive tuberculosis, 2 probable and 2 unresolved pneumonias, doubtful of final proof of "acute" silicosis. Need for more accurate occupational histories, dust concentrations, etc.

Silicosis; analysis of factors involved in its production. L. U. Gardner, Industrial Medicine, 2:27-32, July, 1933.

Interesting technical paper with description of experiments and suggested conclusions under following subheadings: (1) Atmospheric concentration; (2) inhalability; (3) retention; (4) focalization; (5) duration of contact with the tissues; (6) pressure and

mechanical injury; (7) physicochemical composition and (8) coexistant infection.

Silicotic lungs; the minerals they contain. W. R. Jones, Journal Hygiene, 33:307-329, 1933.

Interest aroused on finding rock not fulfilling legal definition of "silica rock" (English law) in South Wales coalfield, where post mortem had revealed silicosis existed.

Obtained several samples of silicotic lungs and based conclusions on an examination of the mineral residues. Describes method employed in obtaining mineral residues free from organic material and on which he bases conclusions that all mineral residues of silicotic lungs consist of minerals in which silica is in combination with other elements to form silicates, particularly, the hydrated silicate of aluminum and potassium—sericite (secondary white mica).

Examination of mineral residues under petrological microscope reveals countless mineral fibres, hundred for every grain of quartz. Majority from 0.5 to 2 microns long and 0.1 to 0.5 microns thick.

Sericite most common in rocks containing high percentage of free silica in form quartz, it is not however present in all rocks that contain quartz.

All residues of silicotic lungs show grains of quartz much larger than largest fibres of sericite. In alveoli, it is unusual to find a grain of any mineral larger than 2 microns long.

One quartz grain of 10 microns has the same volume as 800 fibres of sericite 2 microns in length. A Dr. McCrae states that 70% of the whole material (mineral residue from lung) was less than one micron in diameter. Contends that this 70% of fine particles plays chief role in causation of silicosis.

Makes comparison of silica rocks—gold bearing quartz of Transvaal, South Africa, notoriously dangerous, contains between 80-90% of free silica (quartz) while gold bearing quartz of Kolar gold-field, India, contains over 90% of same. South Africa rock involves thousands of cases of silicosis—Kolar rock dust gives no case of silicosis over many years. Concludes this due to presence of serecite fibres which are absent in Kolar rock. Same situation analyzed and described concerning Scottish coalfields and those of South Wales—the latter inducing silicosis.

Abundant evidence that silicates cannot be regarded as a single group showing uniform effect on pulmonary tissues.

Etiology of silicosis. A. J. Lanza. Journal American Medical Association, 101:583-584, 1933; also abstract in American Journal Public Health, 23:1191-1192, 1933.

Gives definition of silicosis adopted by the Commission on Pneumoconiosis and the Commission on Standards of the American Public Health Association, November, 1932. Excellent discussion of studies showing importance of T. B. and syphilis infection. Age as a cause factor. No correlation with bad living conditions.

New light on silicosis. Rock Products, 36:27-28, December 25, 1933.

Very brief comment on Jones paper, "Silicotic Lungs; The Minerals They Contain." Explains sericite theory.

Pathogenesis of pulmonary silicosis; the method of formation of the silicotic nodule. A. Policard. Abstract Journal Industrial Hygiene, 15:75, July, 1933.

Abstract of paper in French Medical Journal. Author expounds theory that "silicosis is a pulmonary tuberculosis which has become fibrous under the influence of silica particles."

Acute silicosis. R. Pomeranz. Journal of Medical Society, New Jersey, 30:320-326, 1933.

Discusses pathology of silicosis. Then describes five case histories of deaths from acute silicosis—victims exposed from 14 months to 2 years to extra fine silica powder. Technical paper of interest to student of silicosis.

The roentgenogram in so-called "acute" silicosis. Homer L. Sampson. American Journal Public Health, 23:1237-1239, 1933.

Excellent explanation of erroneous interpretations of roentgenograms, particularly in early stages, with description of diagnostic signs and the need for serial exposures.

The clinical manifestations of silicosis. R. R. Sayers, Journal American Medical Association, 101:580, 1933.

Comments based on study carried out among 7722 miners in Picher district of Oklahoma in 1928. Technical discussion of symptoms in varicus stages of silicosis.

Silicosis and other pneumoconiosis. Rock Products, 36:29, Dec. 25, 1933.

Comment on paper by A. E. Russell delivered at spring meeting, Portland Cement Association, 1933.

The use of scientific methods in prevention, control, and defense of silicosis cases. Mimeographed sheets, 5 pp. Read at Engineering Division of the Chicago Safety Council, December 21, 1933.

General discussion on value and use of dust counts, stresses need for critical analysis of all factors relating to cause and control occupational hazards.

The pathology of various mineral dust diseases. L. O. Gardner, reprint.

The diagnosis of silicosis. A. R. Smith, reprint, Safety Engineering, March, 1934.

Discusses ability of lung to discharge dust-toxicity of silica—characteristic effect produced in lung—frequency of complicating tuberculosis—tests on experimental animals—brief comment on sericite theory. Illustrated.

The diagnosis of silicosis. A. R. Smith. Non-technical explanation of diagnosis procedure stressing non-reliability of lung performance tests and value of expert X-ray diagnosis.

Disease developing gradually held not compensable under workmen's compensation act. U. S. Public Health Reports, 46:1876-1877, 1931.

Tennessee Supreme Court; Morrison v. Tennessee Consol. Coal Co. decided June 10, 1931. Alleged T. B. and infection of respiratory organs had gradually developed. Question to court whether injury was compensable. Statute provides injury must result from accident (unforeseen, unexpected and fortuitous). Inception of disease must be assignable to a determinate or single occurrence. Intent of compensation act not to include diseases which developed gradually or by "gradual process."

Silicosis in certain of its legal aspects. A. J. Farrell, Industrial Medicine, 1:35-37, 1932.

Discusses difference in methods of paying claims under compensation act and common law. Typical procedure of ambulance chasing lawyer. Suggests protection through proper legislation framed by experts.

Wisconsin Industrial Commission—General orders on dusts, fumes, vapors, and gases, effective March 18, 1932. Wisconsin Industrial Commission, Madison, Wis.

Gives specific requirements for mechanical protection with tables showing allowable concentrations of dust, gas and vapor fumes. Harmful concentrations of silica dust 15 million particles, under 10 microns per cubic foot of air, when the quartz content of dust is 35%. This will not be used as a standard in determining violations of the statutes nor in application of penalties under compensation act until legally adopted as a part of order 2002.

Time limitation in compensation for industrial diseases. May R. Mayers. Journal Industrial Hygiene, 15:466-472, 1933.

Discusses differences in application of theory of time limitation to compensation for industrial diseases. Certain states, time limitation relates to time of leaving employ. Other states it is based on date when disease is "contracted." Points out specific difficulties by citing cases where term "contract" was used.

Pennsylvania—Occupational disease compensation. Reports of the Pennsylvania Commission on Compensation for Industrial Disease to Governor Pinchot, Harrisburg, 1933, pp. 96.

Offers 11 general conclusions concerning question of legislation covering compensation of occupational disease, without recommendations for or against enactment of law. Gives complete reports of three committees: medical; scope and cost; legal. Medical committee recommends exclusion of "Pneumoconiosis from cement dust" from list of scheduled diseases.

Silicosis — Compensability under Workmen's Compensation Act (California). When right to compensation begins. Journal American Medical Association, 101:1507, 1933.

Report of decision in three cases by California Supreme Court under Compensation Act proceedings must begin within 6 months from date of injury—one year for deaths. Right to compensation does not accrue until disability occurs even after employment is terminated.

Silicosis—Duty of employer at common law. Journal American Medical Association, 101: 1509, November 4, 1933.

Report of U. S. Circuit Court of Appeals opinion case Pennsylvania Pulverizing Co. v. Butler. Negligence cannot be imputed to an employer who provides machines and appliances generally used in his line of business. Employer is not an insurer. Judgment of trial court reversed.

Workmen's compensation for silicosis—Report of the Committee on Pneumoconiosis of the American Public Health Association, 39 pp. Pamphlet printed by Association of Casualty and Surety Executives, New York, 1933.

Discusses four methods by which silicosis and other pneumoconiosis are included as compensable diseases in laws of countries, states, provinces through world.

Brief discussion of distinction between compensation laws in United States and foreign countries. 12 pp. chart showing legislative provisions all countries for compensation for diseases of lung caused by dust.

Pneumoconiosis—The claim man's nemesis. Jas. J. McKenna. Reconstructed from a talk to the Casualty Adjuster's Association, Chicago, Dec. 1931, Revised, December 27, 1933, 26 pp. printed pamphlet. ... ...

Illinois policy coverage; etiology, symptomatology and diagnosis; interesting decisions; defense of suits; comp. and occupational diseases; all stautory provisions. A discussion.

Silicosis Commission. Illinois Manufacturers Association. O. E. Mount, Manufacturers' News, 45:40, 1934.

Tells of decision at September 8, 1933, meeting to influence amendment of compensation act, p. 7 of Section 3, to include "silicon dioxide and other noxious dusts" and to have injury from same included as compensable accident. Then follows brief discussions of present claims situation in Illinois.

Tendencies in Workmen's Compensation. U. S. Chamber of Commerce Insurance Bulletin No. 43, 1933.

General discussion of compensation trends and costs with recent changes in legislative provisions. Complete chart of compensation

provisions for all states with data and nature of changes from original law through 1933.

Cement plants fight silicosis racket. Rock Products, 37:45, May, 1934.

Brief article on recent silicosis cases, one in Illinois which was terminated by granting of defendant's motion for instructed verdict; two cases in Missouri lost. Points out methods of soliciting by lawyers, need for careful scientific defense. States problem should be attacked by organizing clearing house to analyze every case filed and by prosecuting unethical lawyers and doctors in co-operation with Bar Association and Medical Association.

Impinger dust sampling apparatus as used by the United States Public Health Service. L. Greenburg and J. J. Bloomfield. U. S. Public Health Reports, 47:654-675, 1932.

Complete illustrated description of impinger dust sampling apparatus with explanation method and technique in using. Table gives results of dust counts in several industrial locations including cement.

Methods for the control of dust in industry and protection of the worker. T. Hatch, Transactions of National Safety Council, 21st Annual Safety Congress, 1:61-65, 1932.

General discussion of dust control measures stressing wide difference in dusty processes and possible control mechanisms. More detailed description of function and design of dust hoods. Data on design of exhaust hoods should be secured only by experimental investigations. Codes should state permissible dust concentrations.

Physical examination of employes engaged in the manufacture of portland cement. G. E. Tucker, American Journal of Public Health, 5:560-571, 1915.

Interesting and detailed paper although out of date. Based on review of literature, physical examination of 956 employes in one plant, examination of men from 4 other mills, medical records and guinea pig experimentation. There is no evidence of injurious effects from cement dust.

Studies on the industrial dust problem. 1. Dust inhalation and its relation to industrial tuberculosis. L. Greenburg, U. S. Public Health Reports, 40:291-309, 1925.

Comments on studies made of ratio of T. B. deaths to total deaths in various industries and to effects of limestone and cement on susceptibility to T. B., quoting conflicting authorities.

Silicosis in New York State. Study of cases of silicosis from standpoint of compensation. 22 pp. M. R. Mayers. State of New York Department of Labor Bulletin (Bureau of Industrial Hygiene), 1926.

Forward gives definition of forms of pneumoconiosis. Brief statement of differential diagnosis between silicosis and pulmonary tuberculosis; 15 brief case histories. Several common questions and answers on dust diseases.

Health of workers in dusty trades. 1. Health of workers in a portland cement plant. U. S. Public Health Service Bulletin No. 176:138, 1928.

Detailed explanation of purpose; methods used in making study. Subject divided into six following classifications: Dust problem in manufacture of portland cement; disability among cement workers as compared with other workers; factors affecting the frequency of disabling sickness; physical examinations; pneumoconiosis among cement workers; summary and conclusions. This study was completed and submitted for publication in August, 1927.

Prevalence of tuberculosis in industry. A. J. Lanza and R. J. Vane. Abstract in Safety Engineering, 60:100, 1930; Monthly Laboratory Review, 31:609-610, 1930.

Two casual factors in T. B. in industry—social-economic status and specific occupational hazard. Mortality rates of three classes of population shows industrial policyholders of Metropolitan Life have poorest showing—ordinary policyholders the highest, and general population in between (males). Occupational mortality statistics meagre but rate differences cannot be explained entirely by economic conditions. Gives high mortality rates for certain occupations (miners, granite cutters, quarry—limestone quarry rate 3 to 1 against 16 to 1.7 for granite). State greatest T. B. hazard is silica dust.

Health of cement workers; inquiries into the existence of hazards in the industry. F. H. DeBalsac, E. Agasse-LaFont and A. Feil. Abstract, Journal Industrial Hygiene, 14:131-132, 1932.

States during manufacture of cement there is exposure to heat and dust but no toxic risks if carbon monoxide from furnaces is excluded. Mentions "cement itch," chronic bronchitis, conjunctivitis. Modern methods rapidly correcting troubles. Original paper details four investigations covering 1371 workers.

Dust hazard in rock products industry; papers and discussion at the National Safety Congress. Rock Products, 35:14-17, 1932.

Relatively non-technical discussions on (1) kinds of dust encountered in industry and their effect on the lung tissues, (2) analysis of mineral industry dusts, (3) clinical and statistical studies in dusty trades, (4) dust control measures and (5) physical examinations and protective equipment. Authors—L. U. Gardner, J. J. Bloomfield, A. E. Russell, T. Hatch, Philip Drinker.

Are all dusts hazardous? C. O. Sappington. National Safety News, 25:18-20, 1932.

Excellent non-technical discussion of (1) kinds of dusts; (2) dust in the lung; (3) cause of fibrous reaction; (4) silicosis; (5) length of exposure; (6) stages of silicosis; (7) protective methods; (8) legislation.

Relative pneumonia fatality among surface workers and miners. C. H. Kibbey, American Journal of Public Health, 22:360-366, 1932.

A study of 2603 cases of pneumonia and 238 deaths from tuberculosis 6 years, 1925 to 1930.

Pneumonia incidence

Ore miners—11.3 cases per 1000 miners.

Surface workers—5 6 cases per 1000 miners.

Coal miners—4.6 cases per 1000 miners.

Pneumonia deaths

Surface workers—29.6 deaths per 100 cases.

Ore miners—23.0 deaths per 100 cases.

Coal miners—22.8 deaths per 100 cases.

Colored coal miners died at rate twice that of white.

Tuberculosis deaths

Coal miners—1.28 deaths per 1000 persons per year.

Ore miners—1.14 deaths per 1000 persons per year.

Surface workers—0.46 deaths per 1000 persons per year.

Total population average, 0.44.

High pneumonia incidence of ore miners explained in exposure to sudden temperature changes.

Practically 100% of coal miners have anthracosis but pneumonia incidence is exactly in proportion to population. Lowest fatality rate indicates anthracosis does not predispose.

High T. B. of miners due to lack of sun rather than respiratory infection.

Silicosis and the industrialist. H. Ballantyne. Journal of State Medicine, 40:342-349, 1932.

Discussion by the technical managing director of Lever Bros., Ltd. (England). Asks pertinent questions about silicosis causation which must be answered before management can intelligently and positively develop preventive measure.

Silicosis. An interpretive review of accumulated experience. C. O. Sappington. Industrial Relations, 1932, Chicago, 21 pp.

General discussion defining silicosis, cause, detection, compensation experience and laws, protection against and essentials for preparation of defense of claims. Non-technical.

The health of workers in dusty trades. U. S. Public Health Bulletin No. 208, 1933.

A comparative study of various dusty trades to determine whether exposure to dust will produce pulmonary pathology. Tables show sickness experience cement plants and others, dust concentration in various occupational environments and in outside air, city and country, clear and rain.

The mortality experience of an occupational group exposed to silica dust, compared with that of the general population and an occupational group exposed to dust not containing silica. E. L. Collis and G. U. Yule, Journal of Industrial Hygiene, 15:395-417, 1933.

For all ages the comparative mortality figures of the silica group is 592.2 against 163.5 for standard population and 172.4 for non-silica group, T. B. deaths. An interesting study by cause of death made in England to show comp. mortality records of silica workers. Suggests procedure.

Metropolitan Life Insurance Co.—Silicosis Metropolitan Life Insurance Co., N. Y. Industrial Health Section, Pamphlet (a) 475 L. W. 32 pp., December, 1933.

Description, causes and complications with more detailed discussion of measures designed to prevent occurrence. Relatively non-technical.

Silicosis problem and the quarry man. C. H. Vivian, Rock Products, 36:24-27, December 25, 1933.

Excellent non-technical presentation of subject. Definition, state of silicosis, dust concentrations and particle size, prevention methods, need of co-operation between industries, description of Kelley dust trap.

Some dust hazards of industry—with particular reference to silicosis. Frederick Willson, printed pamphlet 15 pp.

General, non-technical discussion of dust hazards, action of silica on lungs, suggestions for dust elimination and protection and need for plant medical supervision.

Symposium on silicosis at American Institute of Mining Engineers annual meeting. Rock Products, 37:56-9, April, 1934.

Excellent abstract of papers presented at one day session on silicosis. Annual meeting, A. I. M. M. E., February, 1934. Covers cost of claims, need of scientific research with recommendations, paper on silica as a poisen—determination of extent of hazard—dust control methods—diagnosis (statement that diagnosis could not be made from X-ray films. Such photos could be duplicated from lungs not affected. Other diseases sometimes show same kind of films)—outline of proposed research and costs, to be conducted at Columbia University.

Silicosis; its economic aspects. P. F. Tillson, Engineering and Mining Journal, 135:262-4, June, 1934.

Quotes figures at length and gives detailed data on cost of compensation, losses in various states and industries caused both by common law awards and compensation payments. Difficulties in insurance rate determination because of varying legislative provisions and lack of stable experience. New Jersey and Illinois court decisions relieved insurance carriers from liability for silicosis claims at common law—still question of interpretation of clauses under Standard Policy. Some form of protection must be obtained.

Silicosis legislation; with special reference to proposals in the state of New Jersey. B. F. Tillson, Engineering and Mining Journal, 135: 68-70, February, 1934.

Points out terrific economic burden of silicosis in industry. Lists industries having dust hazards including cement. Discusses silicosis racket and need for protection under compensation laws. Gives thorough analysis of bill submitted to New Jersey legislature with particular emphasis on weakness of administration and dangers of arbitrary definitions.

Silicosis; pathological aspect of causation—determining the disease. B. F. Tillson, Engineering and Mining Journal, 135:167-70, April, 1934.

Technical and thorough. Discusses theories which attempt to explain influence of silica particle on cell structure. Lists 5 phases by which mineral dusts are disposed of by phagocyte and pathology. Detailed discussion of methods of determination of silicosis pointing out possibilities for error in X-ray technique. Points out lack of positive results in all chemical methods of extracting mineral matter from lungs. Questions value of investigations to date, including Jones sericite theory.

Silicosis. A. R. Riddell, Canadian Chemistry and Metallurgy, 18:32, February, 1934.

Brief abstract of papers presented at Toronto Biochemical Society, January 18, 1934.

1. "Silicosis," by A. R. Riddell. General discussion.

2. "The Total Silica Content of the Lungs from Cases of Silicosis," by H. E. Rothwell.

	% SiO_2 in dried lung	Exposure in years	Highest content of non-silicotic lung—0.517%
Low	0.26	6 years	Average—0.129
Average ..	1.73	12 years	
High	7.59	23 years	

3. "The Silicate Content of Silicotic Lung Ashes," by C. M. Jephcott. Tells of experiments on sections of 7 lungs. Chemical analysis of insoluble ashes shows silicon dioxide approximately 50% and balance basic and acidic silicates.

Industrial diseases and compensation. M. R. Mayers. Safety Engineer, 59:30-88, January and February, 1930.

Discusses difficulty of administration of compensation law for industrial diseases. Determination of extent of disability and cause complicated by absence of acute clinical symptoms particularly in diseases of non-bacterial origin. Success of compensation law dependent on accuracy of diagnosis. Discusses diagnostic difficulties of lead poisoning as an example. Points out vital difference between diagnostic problem of physician and compensation tribunal.

Very least an employer should know about dust and fume diseases. Frederick Willson, Safety Engineer, 62:317-318, 1931.

Brief popular article stressing the employer's responsibility to exercise reasonable care for employe's safety. Size of harmful dust particles and conditions under which dusts and fumes are hazardous.

Dust studies. Safety Engineer, 63:87, 1932.

Brief comment on studies of U. S. Public Health Service. No information.

Clinical and statistical aspect of silicosis. A. E. Russell. Transcript of National Safety Council, 21st Annual Safety Congress, 1:57-61, 1932.

Brief review of economic cost of silicosis. Defines three stages of silicosis. Discusses diagnostic technique pointing out that X-ray alone is not sufficient. Tuberculosis as a complicating factor. Cites cases of silicosis developing long after exposure to dust ceases. Gives mortality table showing rapid increase in T. B. rate since pneumatic tools were introduced in granite industry.

Dust in industry. J. J. Bloomfield. Mechanical Engineering, 55:229-233, 1933. Excerpts, National Safety News, 27:33-34, 1933.

Discussion of factors involved and technique employed in study of quantitative phases of industrial dusts which may produce injury. Degree of health hazard dependent on numerological composition, particle size and quantity. Detailed and illustrated explanation of methods employed and apparatus used in determining exact dust conditions with table giving average count in dusty trades.

The prevalence of silicosis in the general population and its effects upon the incidence of tuberculosis. A. J. Lanza and Robt. J. Vane. Reprint from American Review of Tuberculosis, Vol. XXIX, No. 1, January, 1934. (Request reprints from authors at Metropolitan Life Insurance Co., New York.)

Points out silicosis is not a reportable disease and explains method of estimating prevalence of silicosis and effect on incidence of T. B. Analyzes per cent of persons exposed in various occupations and concludes upward of 500,000 workers now exposed to harmful degree. Presents table by occupations showing ratios of actual to expected deaths from T. B., drawing inferences to indicate relationship in high death at certain age levels and exposure to silica dust.

Silicosis. R. R. Sayers. Public Health Reports, 20:595-602, May, 1934. Obtain from Superintendent of Documents, Washington, D. C. Ask for Reprint No. 1626 of Public Health Reports. Price 5c. (Stamps not acceptable.)

Brief mention of references to silicosis in early literature. Gives definition of three stages of silicosis used in South Africa and Ontario. Defines pathology. Methods of making dust counts. Necessity of physical examinations. General paper, reviewing briefly various aspects of problem.

Inhaled silica and its effect on normal and tuberculous lungs. L. U. Gardner. Journal of American Medical Association, 103:743, September 8, 1934. Request above issue from American Medical Association, 535 North Dearborn St., Chicago. Remit 25c.

Present knowledge must admit possibility of harm in silicates as well as free silica. Silica a tissue poison. In high concentration produces rapid necrosis of cells—in low dilutions causes nodular fibrosis. Non-siliceous dusts apparently do not increase susceptibility to T. B. If inhaled in combination with silica they apparently modify action of latter and decrease susceptibility to T. B. Author describes several animal experiments to support statements concerning poisonous effect of free silica on tissues.

Review of silicosis. Adelaide R. Smith. Industrial Bulletin, New York State Department of Labor. (Request direct from New York State Department of Labor, Albany, N. Y. Ask for copies of The Industrial Bulletin issues of February, April, June, July, September, and November, 1932. Price 10c each.)

PART I—February

First of a series on all aspects of silicosis problem. Definition of silicosis. Chemical properties of silica. Crystalline silica insoluble in water and acids except hydrofluoric. Slowly soluble in aqueous solutions of alk. hydroxides and carbonates. Occurrence of silica in nature. Lists quartz rocks. Industrial uses of silica—gives list and types of silica used.

PART II—April

Exposure to silica dust in industry. Factors in development of silicosis—free silica most injurious—compares danger of grinding sand with 99% and cement dust with 6 to 8% free silica—size of particles—little silicosis develops where clay is present—definite standards of safe dust concentration not yet determined. Reviews studies made in United States among miners, granite, cement and other workers, relating to silicosis. Summary of hazardous industries—cement not listed.

PART III—June

Dust disposal mechanism of lungs. Action of silica on body tissues. Silica and tuberculosis—definite relationship established. Pathology of silicosis—describes growth and appearance of silicotic nodule—characteristics of tuberculous silicosis. Post mortem appearance of silicotic lungs—presence of silica can be determined by chemical analysis after ashing.

PART IV—July

Symptoms and course of silicosis: Susceptibility varies with such conditions as nasal obstruction, infection and age. Individual may not be aware of development even when extensive changes in lungs take place. Physical signs unreliable—describes some characteristics. Complications include T. B., pleurisy, recurrent chest colds. Description of X-ray appearances and diagnostic procedure.

PART V—September

Prevention. Combined chemical and petrographic analysis best. Dust count methods described. Control measures discussed—isolation of processes, exhaust ventilation, water, plant cleanliness, masks and helmets, alteration of work, medical supervision, education of workers.

PART VI—November

Silicosis compensation in United States. No state law specifically deals with silicosis. Unsatisfactory to add silicosis to already existing schedule of compensable diseases. Law should define silicosis, provide for diagnosis and determine compensability. Need for special medical board imperative—cites examples. Amount of compensation should be fixed and according to degree of disability.

Silicosis. The hazard, what it is, and how it may be prevented. J. D. Hackett. New York Industrial Bulletin, 11:475-476. (Direct from N. Y. State Department of Labor as above. Ask for December, 1932, issue. Price 10c.)

Popular article. Tells of interest of New York Division of Ind. Hygiene in making silicosis a compensable disease. Stresses necessity for and means of prevention. States allowable dust limits to be 20% silica in dust less than 10 million particles under 10 microns per cubic foot. No worker should enter dusty trades without prior physical examination. Believes dust control will prove operating economy as well as silicosis preventive.

The pathologic reaction in various pneumoconiosis. L. U. Gardner. Journal of American Medical Association, 101:594-598, August 19, 1933. Price 25c. Same issue 2647M, 2675M, 2713M, 2733M. (Write American Medical Association, 535 North Dearborn St., Chicago.)

Pneumoconiosis predominately either linear, nodular or diffuse in character. Phagocytic action described. Discusses lymphatic elimination; pulmonary parenchyma; effects of mixed dusts with specific examples. Technical and thorough paper.

Pumicite

Napa, California: Over 2000 tons of Napa county pumicite from the property of P. King, Jr., was recently reported being shipped to San Francisco. It is to be used for part of the new federal office building being erected, to occupy a full block in the civic center.

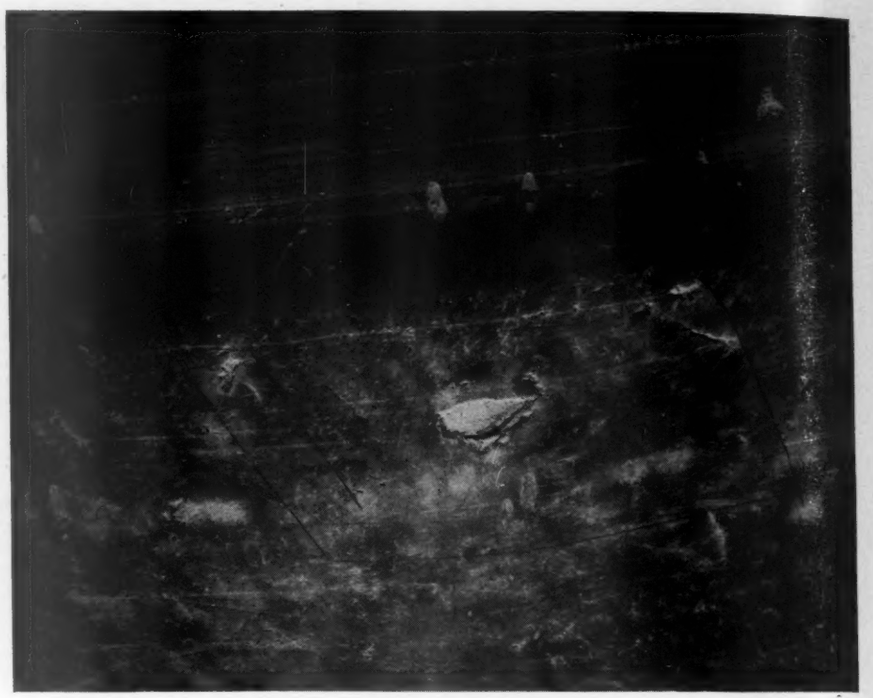
Prolonging Conveyor Belt Life

By Paul Wm. Van Orden*

THOSE who have been vitally interested in the conveyance of materials by belts have watched the art progress from the use of bare canvas and solid woven belts to plied, rubber-impregnated, duck carcass protected by a wearing surface of rubber. Although stitched canvas and solid woven belts are still widely used in many industries, this article is confined to the available means of prolonging the useful life of rubber and fabric conveyor belting.

Today there are four "standard grades" of rubber conveyor belting manufactured from three weights of cotton duck and four grades of rubber cover. These four grades represent the outgrowth of an experiment conducted by some long forgotten individual who, in an emergency, used a piece of rubber covered transmission belt instead of the conventional canvas. His discovery that the rubber cover, thin though it was, had a remarkable resistance to wear, was the signal for rapid progress in material handling.

As conveyor equipment manufacturers became increasingly aware of the possibilities of this new mode of material handling its application to an ever widening field was inevitable. The problem of the rubber manufacturers was to keep pace with the parade. This they have done despite the fact that the purposes of the four grades of belting just mentioned range from conveying light fluffy rock wool to "run of quarry" stone, in climates varying from the bitter cold of Alaska to the soul-frying heat of the Chilean nitrate fields.



A typical belt injury

Grant, for the moment, that your belt is operating on a perfectly engineered installation and that the belt itself is properly selected for grade, carcass strength and cover thickness. It still is subject to certain injury beyond the control of the operator. These injuries, if not cared for, are like an injury to one's body. Their effect is accumulative and they eventually relegate the belt to the graveyard before it has had the chance to give its full measure of service.

Cut-out section of belt filled with vulcanizing cement

How a Belt Is Constructed

Before going into the remedy, let us investigate, briefly, the anatomy of the "critter" and avoid prescription without first developing a clear mental picture of its "innards" and the function of its component parts.

A rubber covered conveyor consists of two parts, an impregnated duck carcass or tension member and a protective, abrasion-resisting rubber cover.

The carcass is built up—ply on ply, of cotton duck, which has been "frictioned" or impregnated with soft, plastic rubber. This rubber serves not only to hold the various plies together, but provides an insulating medium to prevent internal friction and serves as a cushion to protect the cotton duck from injury. The plied duck carcass, designed to function as a unit, must be built with due regard for equalization of stresses and should, therefore, have no longitudinal or transverse seams and no folds.

A cover, designed to protect the carcass from wear, is generally placed directly upon

*Manager, Belting Sales, the B. F. Goodrich Co., Akron, Ohio.

the top and bottom of this carcass, although for "brute" service is often reinforced at that junction point by a ply of tie-cloth—a strong open mesh cord fabric, carried either under the cover and over the edges or completely around the carcass. Its function is to prevent tearing or stripping of the cover in case of violent injury.

Belt Injuries Repaired

With these features of belt construction in mind, let us consider belt injuries and how to cure them—not temporarily by the use of metal fasteners, rivets or plastic materials, but by a process of *rebuilding* quickly, carefully and permanently as the manufacturer himself would do it in his own shop. And let's do it right on the job, *on the installation itself*.

The first reaction to such a proposal is that it is entirely too technical and expensive. That is not the case. It is simple, as the following example will illustrate. The only cost is the investment in an inexpensive, light, portable electric vulcanizer and the necessary hand tools. This represents a really trifling cost compared to the money invested in conveyor belting and the opportunity to prolong its life and to lower costs per ton carried.

The repair on a conveyor belt can be likened to the repair of an automobile casing that has received an injury in service. The repair man in that case removes the injured portion of the tire similar in method to that described here and replaces it with unvulcanized material of the same characteristics as that used in the manufacture of the casing itself. This is built up ply on ply, so that the resulting structure is for all practical purposes as strong as the original casing itself.

Unvulcanized rubber stock covers injury

In making the repair, the damaged section, rubber or fabric, or both, is cut out and the remaining adjacent material is cleaned by buffing with emery cloth and washing with gasoline. It is then cemented with a vulcanizing cement. The cavity is filled as required with new, unvulcanized rubberized fabric and cover stock. These materials are the same as the original raw materials that went into the building of the belt at the factory. Heat and pressure are applied by the small electrically heated press for 20 to 30 minutes. The press requires no attention during this period. When the press is removed the new material has the same quality and toughness as the original belt, and the belt is ready for use again. The vulcanizing process and the use of the same raw materials that went into the belt originally give a combination of toughness and adhesion between parts which is obtained in no other way.

Trimming cover-stock to remove non-adhering edges

Two questions arise. First, "Doesn't curing the patch injure the surrounding rubber?" The answer to this is: "No, the curing will not injure the surrounding cover nor carcass of a belt built with properly designed compounds. We know of one installation where recurring, unavoidable accidents eventually made it necessary to repair injuries in the same area as many as eight times. There still was no evidence of any loss in vital characteristics."

The second question would be phrased something like this: "If repairing cover injuries and rebuilding carcass breaks by this method instead of metal fasteners, etc., is feasible, why couldn't we go a step further and eliminate the metal splice at the ends of the belt?" The answer is: "You can. That step is not only practical, but highly desirable. And in every instance the results will justify whatever expense is incurred."

Quad-City Quarry, a new concern, was established recently by J. Hohendahl on highway 61 near Muscatine, Iowa. The quarry is to furnish crushed rock and agricultural limestone.

Modern Quarry Transportation

Two views of quarry-to-crusher transportation at Pennsylvania Glass Sand Co. plant near Lewiston, Penn.

Rock Products News Briefs

Silica

Minnesota Mining and Mfg. Co, St. Paul, Minn., recently engaged Totz, King and Day, Inc., to design new construction costing $250,000 at the quartzite mining and processing plant at Wausau, Wis., including a new head house with conveying equipment, belt elevators, etc., and a storage building. 30x300 ft. Work is to begin March 15.

Feldspar

Consolidated Feldspar Corporation and Golding Sons Co., Trenton, N. J., elected M. J. McHugh, Jr., secretary and treasurer, at their board meetings in January.

◈ ◈ ◈

Cement

Pennsylvania-Dixie Cement Corp., New York, N. Y., held a meeting of the members of its metropolitan sales organization recently at the Biltmore hotel. Blaine S. Smith, president, told the members that the year 1934 showed improvement over 1933 for the cement industry. He said that data had been assembled which would indicate an increase in construction during 1935. It was pointed out that there is a need for 5,000,000 homes in this country today, and that due to government assistance toward easier and simpler methods of financing, it appeared that many of these homes will be built during 1935, along with programs for public buildings and highways.

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Pacific Portland Cement Co., San Francisco, Calif., was forced to shut down its plant at Redwood Harbor, Calif., for a day because of a rain storm early in January . The grounds of the plant were flooded, but the damage suffered outside of loss of production was slight.

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Marquette Cement Manufacturing Co., Chicago, Ill., was recently said to be considering the purchase of the property of the Linwood Cement Co., west of Davenport, Iowa. The business of the Linwood Co. has been dormant for several years, but the property consists of 280 acres of valuable limestone deposits, a developed quarry, a rock crushing and screening plant and an unfinished cement manufacturing plant.

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Lawrence Portland Cement Co., Northampton, Penn., has bright business prospects for 1935, according to the opinion expressed by M. S. Ackerman, Jr., manager of the plant, at a dinner meeting of department heads held recently. He said that production in 1934 had increased over that of 1933, and that recent developments indicated a further increase in 1935.

Help Wanted!

A SOUTHERN QUARRY company writes: "We are considering installing a new filing system and will thank you to forward us any data you may on filing systems used by other quarrying companies and any other information you think will be helpful."

Readers are invited to contribute suggestions for publication in these pages.—THE EDITOR.

◈ ◈ ◈

E. J. Mehren, president of the Portland Cement Association, recently said that there was a gain of about 19 per cent in the production of portland cement in 1934 over 1933, and that shipments were 31 per cent of plant capacity. Mr. Mehren believes that private construction is facing a revival in 1935, and says that new developments in concrete house construction have brought thousands of inquiries to the Portland Cement Association from people planning new homes.

◈ ◈ ◈

Muskingum Watershed District: Bids from 14 to 20c lower per bbl. than were quoted on January 4 were received recently for the furnishing of 198,000 bbl. of portland cement for the construction of Tappan, Charles Mill, Wills Creek, Clendening, Beach City, Mohawk and Senecaville dams in Ohio. The proposals were all identical again and it was said that the award of contracts will probably be made by lot.

◈ ◈ ◈

Universal Atlas Cement Co, Chicago, Ill., recently announced the appointment of A. O. Stark as sales manager for the New York City area to succeed N. A. Kelly, who died January 16. Mr. Stark came to the company in 1908 and served successively as clerk in the New York sales department, clerk in general sales and assistant district sales manager. He held the position of export manager and assistant sales manager until his new appointment. W. R. Heckendorn, former district sales manager at Boston, Mass., was appointed assistant sales manager for New York, and H. F. Van Wagner, district sales manager for Newark, N. J., was transferred to Boston to serve in the same capacity.

◈ ◈ ◈

National Research Council, Washington, D. C., recently granted $1000 to Massachusetts Institute of Technology to be used in attempting to solve many untackled problems connected with the hardening and durability of cement. Microscopic examinations of the hardening process at various stages of crystallization will be conducted under Dr. T. S. Brown of the dept. of chemical engineering.

◈ ◈ ◈

Orofino, Ida.: Construction of a new cement plant was to be started in January, according to E. J. Simons, Spokane, Wash., general manager of the Washington-Idaho Lime Products Co. The new plant was to have a capacity of 500 bbl. in 24 hours and to provide employment for 40 men.

◈ ◈ ◈

Cementos Atoyac, S. A., recently completed the construction of a new railway between their plant and quarry at San Jeronimo. The new quarry supplies the plant with limestone for the manufacture of lime in one of the rotary kilns, and is used in the manufacture of the two new products, "Atoyac" cement and "Plastocement." In the construction of the new railway concrete ties made with Atoyac cement were used throughout, and in view of the fact that the land over which the railway traverses is highly alkaline and spotted with springs of sulphur water, this is considered a very good test for the cement. Service between the plant and quarry is at present conducted through the use of two 8-yd. Western type dump cars and a Whitcomb locomotive using gas oil as fuel. Concrete posts have been constructed and services will also be made shortly with an electric locomotive that the company has purchased. Incidentally, limestone for the manufacture of portland cement clinker is also being obtained exclusively from the new quarry.

◈ ◈ ◈

Lehigh Portland Cement Co., Allentown, Penn., is reported to have started the annual replacement and modernizing program at its Metaline Falls, Wash., plant, including installation of a temperature and moisture control system in the testing laboratory. A new 8-ton gasoline locomotive, for use between the quarries, has been received and placed in operation. Six cars for the company are under construction in the plant shops.

Credit for Photograph

THROUGH a last minute correction of a typographical error on page 21 of the February issue of ROCK PRODUCTS, the credit line of a copyrighted photograph was omitted. This should have been credited to the Acme Newspictures.

New Machinery and Equipment

Oil and Grease Seal

DEVELOPMENT of a new oil and grease seal is announced by National Motor Bearing Co., for application to all types of machinery embodying shafts. The unit consists of an outer steel case which locks the seal assembly permanently. This outer case has a press-fit accuracy of .002-in. tolerance, plus or minus, on the diameter; an equalizing annular garter spring within the case provides for uniform, continuous contact, says the company.

The sealing member contacting the moving shaft is made of various materials, usually a processed leather, to suit different conditions such as temperature, speed, etc. The unit is offered particularly for cement and quarry machinery.

New Crane Series

WITH CRANE-LIFTING capacities ranging from 6½ to 8½ tons at 10-ft. radius, the new series of motor-truck mounted cranes and shovels, manufactured by Universal Crane Co., are known as models 40, 37, and 30's. Crane booms are from 25 to 35 ft. in length, and may be equipped with straight boom tip extensions to afford a maximum 55-ft. boom. Gooseneck extensions are also offered.

The full-revolving, single-operator units are powered by 6-cylinder gasoline engines. The shovel boom is of the same design as used on crawler machines. Dippers range from ⅜ to ¾ yd. capacity.

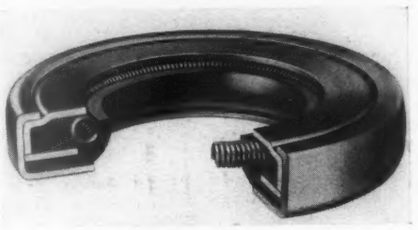
Grinding-Separating Data

COMBINING the recorded results of its various units in operation on cement, lime, limestone, gypsum, slag and other operations, the Williams Patent Crusher and Pulverizer, Co. includes the following in its recent announcement concerning the latest mill and separator combinations recommended by its engineers.

Grinding cement clinker in a Williams "Super-Separator" 5-roller mill took 90 hp. to produce 3 to 8 tons per hour with its output rated 90% through 200-mesh. On gypsum the data is 8 to 10 tons per hour; 80 hp; 90% 100 mesh on a 5-roller mill "S."

On lime, 7 to 12 tons per hour; 35 hp.; 80% 200-mesh on hammer mill "S." On hydrated lime: 4 to 7 tons per hour; 35 hp.; 99% 200 mesh on hammer mill and "Super-Separator." On limestone: 6 to 9 tons per hour; 70 hp.; 80% 200 mesh on a 5-roller mill. On slag: 5 to 8 tons an hour; 80 hp.; 80% 200-mesh on a 5-roller mill.

Regarding the operation of the separator and improved roller mill the company says, "Upon entering the mill the material is ground between the rollers and bull ring,



Sectional view of oil seal

then raised by suction to the top of the separator where it enters the separating chamber between the vanes. Regulation of vanes varies the fineness of the product. The whirling, air-classifying motion returns the large particles for regrinding and the fine material passes into the cyclone collector and then out into the finished product bin. Air from the top of the collector is used again and again with the excess air escaping through the tubular dust collector."

Diesel Line Expanded

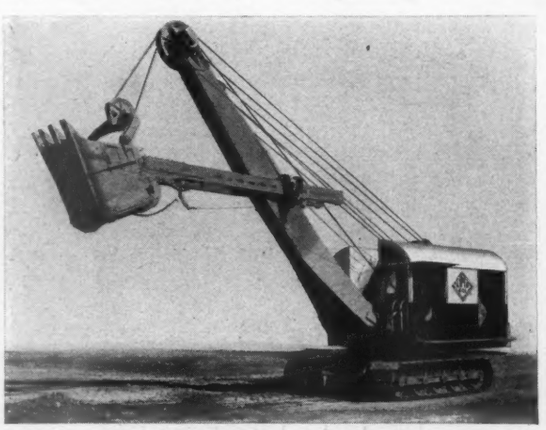
AN ADDITION to its line of six-cylinder Diesel engines has been announced by Hercules Motors Corp. The new unit has a displacement of 474 cu. in., and is said to develop 120 h.p at 2000 r.p.m. The torque curve, says the company, varies only some 40 lb. from 600 r.p.m. up to 2200 r.p.m.

Improved lubrication, cooling fans, water jackets, and wet type removable sleeves used for cylinder liners are among the features.

Two-Yard Shovel

BUILDERS of Lima shovels, draglines and cranes have announced a new heavy-duty shovel of 2-yd. capacity, operated with a 35-ton crane. The Ohio Power Shovel Co. designates this unit as "Type 801," to be furnished with gasoline, Diesel or electric power.

When equipped as a dragline, says the company, the unit will effectively handle a 3-yd. bucket. The boom, of box type construction, is electrically welded. The main machinery, including cone rollers, is equipped with roller bearings, and all gears are helical cut. All major motions are independently operated.



Convertible crane unit

Light Weight Compressor

THE NEW V-TYPE compressor of two-stage design, just introduced by Sullivan Machinery Co., is called Type "WK60." Reduced fuel consumption was one of the objectives of the engineers designing it; they employed a new wafer valve "of exceedingly large port area and very low lift."

Equipped with the usual modern compressor and engine accessories such as air cleaners and oil filters, the compressor has been equipped with ports and air piping in such an arrangement as to provide minimum resistance to air flow. The base is welded of structural steel, and the number and weight of all reciprocating parts are said to have been reduced to a minimum.

Capacitor Motors

SAID to be especially adaptable for hazardous locations, a single phase, explosion-proof, self-contained capacitor motor line has been announced by Louis Allis Co. The manufacturer points to the self-contained condenser as the main feature of the unit. "A simple positive-acting switch cuts out the capacitor," says the company, "at a definite pre-determined speed." This new type of motor is available in the non-ventilated type from ½ to 1 hp. and in the totally enclosed fan-cooled type from 1½ to 3 hp.

Shielded Arc Welder

THE Lincoln Electric Co., Cleveland, Ohio, announces its "Shield-Arc" welder. A uniform welding current is one of the outstanding features claimed for the new machine. This is said to result in faster welding. The rating of the machine has been increased from 25 to 40 volts. No stabilizer or kick transformer is required to obtain satisfactory results, the manufacturer claims. A dual control is also provided. Another feature is the reversible current control, which is operated by a small lever on the front of the control panel.

These welders are built in alternating and direct current motor driven types of 300, 400 and 600 ampere sizes and have removable running gear to make change from portable to stationary models easy.

Non-Adjustable Roller Bearings

A NON-ADJUSTABLE bearing unit designed for application where it is not desirable to provide means for bearing adjustment in service is announced by Timken Roller Bearing Co. Where operating conditions require a fixed mounting at one end of an assembly and a certain amount of "float" at the other, certain fits must be observed in order to obtain the proper running clearance, says the company, and this clearance must be established at the time of manufacture.

Fitting practice varies from .0005- to .0015-in. tight for live shaft applications with .0000- to .0020-in. loose fit in the housing for small shafts, up to .0060- to .0100-in. tight and .0020- to .0060-in. loose respectively in the case of 16-in. shafts.

In the accompanying illustration a two row bearing of this type is shown mounted in a solid housing. The company says that it is easily and quickly removed from the housing and shaft for inspection or salvage if pressure is applied to the cone surfaces.

Arc Stabilization

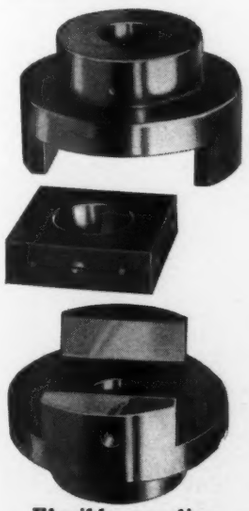
THE ARC WELDER manufactured by Universal Power Corp. is said to involve a new principle of arc stabilization, developed to eliminate need for use of old-style power consuming reactors. According to the company, arc stability obtained in the new unit is effective in reducing starting time and in helping operators to maintain their arc.

Flexible Coupling

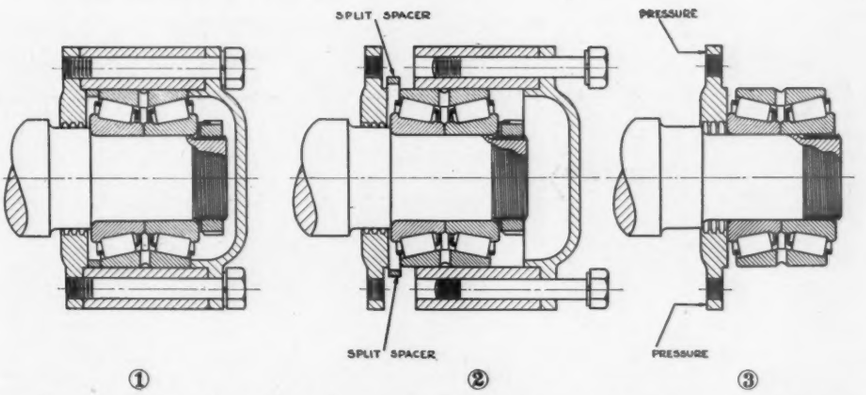
THE D. O. James Manufacturing Co., Chicago, Ill., announces a flexible coupling composed of only three parts.

The center member is made of nonmetallic material self-lubricated by means of a reservoir within itself.

This floating center member slides between the jaws of one metal flange on a line passing through the center. It is free to slide across the face of second flange in a direction which is at right angles to the first, making it mechanically flexible without the use of flexible material.



Flexible coupling



1—Two-row non-adjustable roller bearing mounted in solid housing. Abutting cone faces are ground to provide proper running clearance. 2—First step in removing bearing. When through bolts are loosened, outer cover plate and bearing housing may be stripped off. 3—Continued application of pressure on inner closure plate slides entire bearing assembly off shaft

New Addition to Dragline Bucket Series

EVERY POUND of weight that can be removed from a dragline bucket means a pound of dirt swung to the spoil bank. The science of digging is becoming more and more a matter of specialization. "The all-purpose bucket," in the opinion of engineers of the Northwest Engineering Co., "is becoming a thing of the past, for contractors are finding that light buckets can be used in easy digging and produce a higher output and, of course, greater profits."

This company, builder of gasoline, electric and oil burning shovels, cranes, and draglines, has long been a proponent of this idea and has recently announced a new dragline bucket as a part of its line. This bucket is designed to increase working ranges and output in earth excavation. It is of light weight construction, and has a wide mouth. It is built in three sizes, 54, 67½ and 81 cu. ft. capacities.

Arch Section

While of lighter weight and having a wider mouth, it embodies, say its manufacturers, the well known heat treated Northwest arch. This arch is made of a heavy I-beam section amply capable, it is said, of withstanding the shock of being dropped on the nose. It is claimed that it is impossible to close the arch up by the most severe work imposed on a bucket. The lip is of rolled alloy steel and both arch and lip are toughened by heat treating.

Prospecting Drill

TWO NEW prospecting drill units have been introduced by Bucyrus-Erie Co. Either model is equipped with a 20 hp., 4-cylinder, heavy duty gasoline or a 25 hp. oil engine, with power-take-off shaft mounted in ball bearings.

The former model has caterpillar type mounting, while the model 33-P has steel wheel mounting, and both models are furnished with telescopic derrick for convenience in moving.

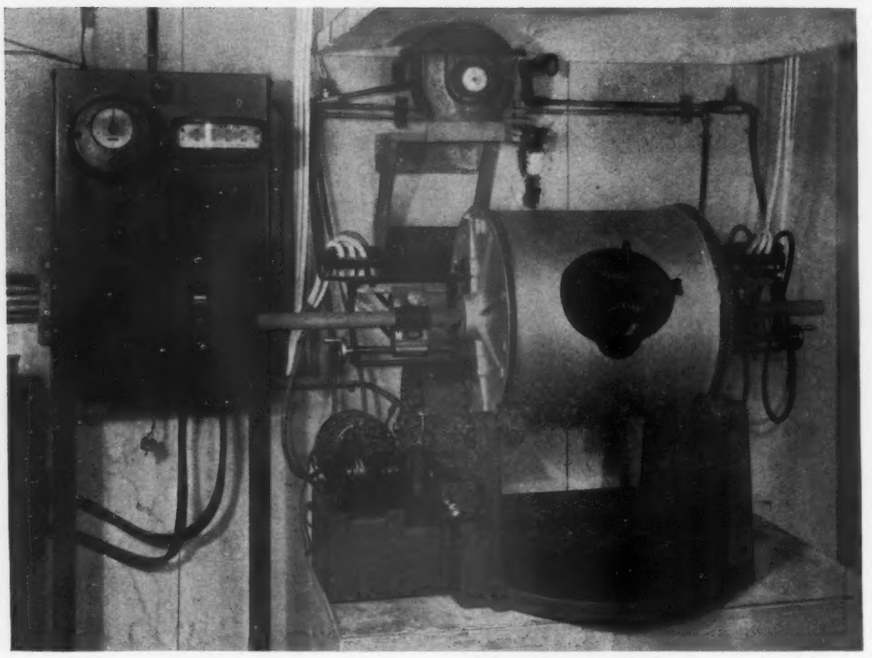
For Welding Manganese

PREPARATION of a manganese steel casting for welding, says the Linde Air Products Co. in outlining a recommended procedure, is just like that for an ordinary carbon steel casting. Edges to be welded are veed to an included 90-deg. angle either

Manganese steel dipper repaired with special welding steel

by grinding or by use of oxy-acetylene cutting blowpipe. The entire casting should be preheated.

A comparatively large welding tip may be used, the company notes, and a fairly large puddle of melted metal should be maintained. Outlining the characteristics of "Hadfield" steel for this purpose, the company points out that it contains from 11% to 14% manganese and 1% to 1.3% carbon. Its surface hardness increases by mechanical deformation, as it is said to have a lower thermal conductivity and a higher coefficient of expansion than ordinary carbon steel.



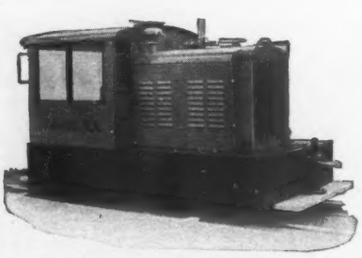
Electric furnace with automatic rocking device

Electric Furnace

THE AUTOMATIC rocking device is the feature of Detroit Electric Furnace Co.'s new electric melting furnace. It has been designed to increase the angle of rock of the furnace shell automatically. The rate of increase may be changed for ferrous and non-ferrous materials. "A feature of the rocking mechanism," says the manufacturer, "is that the shell velocity is zero at the point of reversal despite the constant speed motor. This innovation makes for a quiet, smooth running machine." A special high temperature refractory is used, and with interchangeable shells, the furnace may be used on a variety of material tests.

Industrial Locomotive Series

DAVENPORT LOCOMOTIVE WORKS, a division of the Davenport Besler Corporation, Davenport, Iowa, recently announced a new series of industrial gasoline and Diesel geared locomotives from 2½ to 25 tons weight. They are designed for a wide variety of services, and are said to be capable of maximum hauling power at speeds as low as 2½ to 3 miles per hour. Air-brakes are optional on the 7 to 12-ton sizes, and come as standard equipment on the 15 to 25-ton sizes.



6-ton Diesel locomotive

Rebuilding with Nickel-Manganese

WORN OUT castings can be rebuilt so that the "worn-out" castings will outwear new ones, at a fraction of the price, according to tests of the McLean Welded Products Corp., Chicago, Ill. The principle which makes this saving possible consists of first rebuilding the part with nickel-manganese steel, work-hardening it and then hard surfacing this toughened base metal with a special wear resisting alloy steel. By this processing, it is said that the part can take the shock and stress *inside* as well as the wear and tear *outside*.

Cost Is Low

In the case of pump shells, it is said that a worn-out housing can be rebuilt for less than half the cost of the new one, and yet that it will outlast the new one by 25 to 50 per cent. Rebuilt dipper teeth will cost approximately one-half the price of new ones, says the company, but will outwear them up to 100 per cent.

Crusher heads, pulverizing hammers and other equipment can likewise be rebuilt with a saving and longer life.

Giant Stripper

BUCYRUS-ERIE CO., South Milwaukee, Wis., recently announced a new stripping shovel having dippers up to 22 cu. yd. capacity and a working weight of 2,400,000 lb. This machine, the "950-B," is available with booms up to 110 ft. in length, with dipper handles up to 70 ft. long, and with dippers of 14 to 22 cu. yd. capacities—as may be required to suit pit conditions. It is readily convertible to shovel or dragline operation.

Nitramon

AFTER MONTHS of experimenting and testing, a new explosive, "Nitramon," has been announced by E. I. du Pont de Nemours and Co., Inc., Wilmington, Del. This new product, according to the manufacturers, cannot be detonated by the strongest commercial blasting cap, by impact, by flame, nor by shooting a rifle bullet into it. In actual use it is exploded by means of a large diameter cartridge of dynamite, and it is to be marketed only in large diameters. This explosive is said to be non-headache producing, absolutely water resistant, non-freezing and to represent the ultimate in safety for commercial explosives.

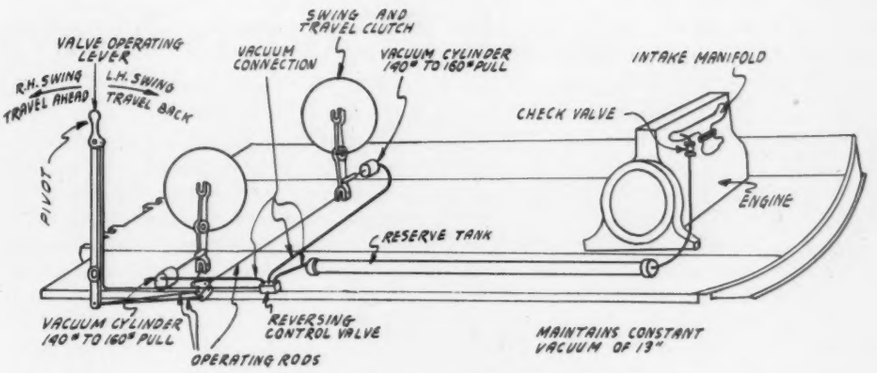
Compensated Air Hose

THE UNEQUAL PLY STRESSES set up in the wall of the hose by longitudinal and lateral tensions incident to operation are compensated and made equal in this new hose, announced by the Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., Passaic, N. J. This is accomplished solely within the construction, which consists of two strength members, a braided cord member for longitudinal stresses and a spiralled strength member for expansion and later stresses, both welded into rubber.

Section of compensated air hose

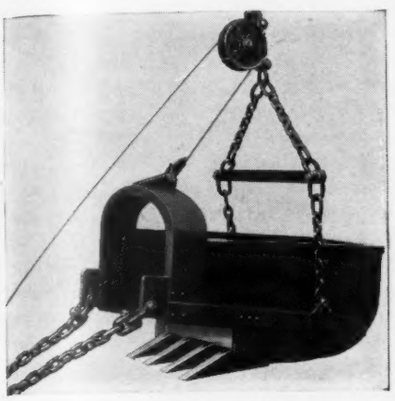
Vacuum Clutch Control

VACUUM created by the engine is employed to actuate the swinging clutches on all new Osgood machines by the Osgood Co., Marion, Ohio. Vacuum is taken from the engine and led to the operator's position, where it is controlled by a valve. This valve controls all the swinging and and traveling motions just by a touch of the operator's finger, which, according to the company, will make the operator much more efficient, by eliminating the tiring labor of tugging away at levers.



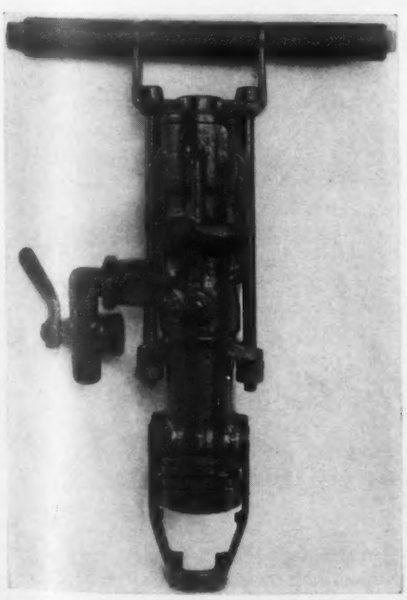
Hook-up of vacuum clutch control

All-Welded Bucket



Light weight bucket shell

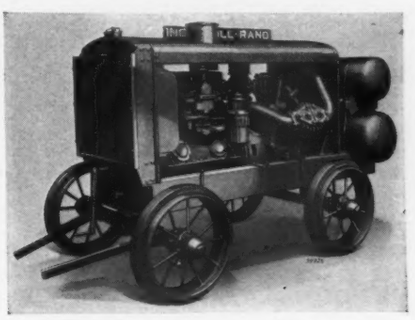
A NEW LIGHT WEIGHT BUCKET has been designed by the Harnischfeger Corp., Milwaukee, Wis., to reduce dead weight to a minimum and to provide great strength through all-welded construction. The bottom, sides and back are formed by a single steel plate, seamed at the back, with angle reinforcement mounted toward the entire upper edge for additional rigidity. Four wearing shoes are welded to the bottom to take the wear from the bucket shell.



Twenty-eight pound sinking drill

Oil-Engine-Driven Portable Air Compressors

INGERSOLL-RAND CO., New York City, has recently doubled its line of two-stage, air-cooled portable air compressors, making all six sizes available with oil-engine drive as well as with gasoline-engine drive. The



Portable oil-engine-driven compressors

oil engine, "Type H," is a 4-cycle, solid-fuel injection engine that combines the advantages of both the gasoline and the Diesel type of engine, with a great saving in fuel-cost, according to company officials.

Two-Stage Compressor and Light Sinking Drill

GARDNER-DENVER CO., Quincy, Ill., recently announced a new 6-cyl., water-cooled, 2-stage compressor, and a new light-weight sinking drill for use in quarries.

Four small-diameter, low-pressure cylinders are used in place of two large ones in this compressor design. As a result of this change, it is said that more delivered air is provided, with a saving in power cost.

The 28-lb. sinking drill, the S-35, is said to be exceptionally easy to handle in places inaccessible to a heavier drill, and to be especially suited for drilling in soft and medium formations. It is equipped with a full grip D handle, short throw tubular valve totally enclosed, one-piece exhaust-control valve and handle, and simple, rugged steel puller.

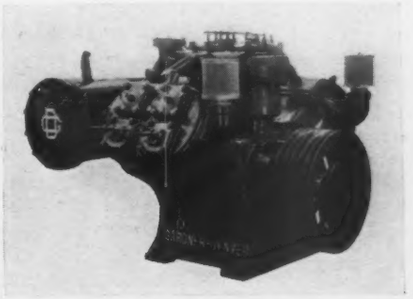
Improved Respirator

THE UNITED STATES BUREAU OF MINES recently gave its approval to the "Comfo" respirator under schedule No. 21. This respirator was developed by the Mine Safety Appliance Co., Pittsburgh, Penn. It features twin side-placed filters with an area of 23 sq. in., and according to tests of the company, the filter material has a resistance of only ⅓ in. (water column) on inhalation. Exhalation resistance is lower, because the standard size U. S. Army Gas Mask type of exhalation valve is used.

The filter disks are designed to protect the wearer against dust down to a fraction of a micron in size, and are replaceable when they become impregnated. The head straps and filters are placed so that there is maximum working freedom and non-interference with vision. The filter cases are made of aluminum, and the over all weight of the respirator is 4.8 ounces.

Motorized Helical Gear Reducers

LINK-BELT CO., Chicago, Ill., is placing on the market a new line of gear reducers, whose outstanding feature is the accessibility of the motor and the high speed gears. It is said that the complete motor, with adapter and motor pinion, may be removed as a unit, without disturbing the alignment of the motor or of the gears remaining in the reducer housing. These new reducers are available in double reduction for ½ to 75 hp., in ratios up to 38½ to 1, and in triple reduction up to 30 hp., in ratios up to 292 to 1.



New 6-cyl. water-cooled compressor

Rock Products News Briefs

Cement

Pennsylvania-Dixie Cement Corp., New York, N. Y., has assembled data which indicate a good increase in building work during 1935, as compared to 1934, according to B. S. Smith, president of the company. In speaking at a luncheon of the sales organization in New York in January, he said that the shortage of residential structures, federal aid in making financing easier, and the prospect of increased public building and highway construction were favorable factors.

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Marquette Cement Manufacturing Co., Chicago, Ill., was to close its Cape Girardeau, Mo., plant on Feb. 10 for a period of two or four weeks, according to an announcement of R. Moyle, general manager, at a meeting of employes. The reason given was that all silos and bins were filled with cement, waiting for the government to come through with some of its expected work.

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Universal Atlas Cement Co., Chicago, Ill., recently appointed W. H. McDowell as sales manager of its Kansas City, Mo., offices to succeed C. S. McArdle, resigned. He is well-known in the cement industry and construction field, having been with the organization since 1911.

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Los Angeles, Calif.: Variations in cement prices charged the Metropolitan water district and the county were discussed recently at a meeting of cement manufacturers and the board of supervisors. Charging that $1.71 was the cost per bbl. to the water district and $2.41 the cost to the county, Supervisor J. R. Quinn asked that representatives of the cement companies meet with the board and explain the differences.

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Colorado Springs, Colo.: The city council recently charged price fixing when they received quotation of identical prices for cement manufactured at Laramie, Wyo., and at Portland, Colo. The contract calls for supplies to go into the construction of the Crystal creek reservoir on the north slope of Pike's Peak. The council finally decided to award the contracts for cement subject to the approval of Secretary of the Interior Ickes.

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Slate

Statistics: According to the U. S. Bureau of Mines, slate sold at the quarries of the United States in 1934 was approximately 229,000 short tons valued at $2,615,000. This was a decrease of 12% in quantity and 3% in value from the output for 1933—259,620 short tons valued at $2,696,185.

Gypsum

Gypsum Association, Chicago, Ill., has issued two new publications: "Standard Specifications for Gypsum Plastering" and "Fire Resistance of Gypsum Plaster." The first of these gives complete specifications covering the mixing and application of the different kinds of gypsum plasters applied to various bases. There are also included, specifications covering the mixing and application of the usual type of finishes commonly employed. The second gives factual information on the fire protection afforded by gypsum plaster which data is taken from the reports of fire tests conducted by the Underwriters' Laboratories and by the Bureau of Standards.

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Crushed Stone

J. T. Jenkins and associates have leased some of the properties of the International Agricultural Corp., at Southport, and have a large force prospecting and mining. *Hackney and Sharp* have leased the Dugger place of Coble, Garret & Smith, at Southport, and have one of the largest forces of miners that has been at work for many months. *Tom Jones* has leased the Chaffin place of Coble, Garret & Smith, at Southport, and has been mining for some time. All these firms, together with the TVA mining on the Wheeler property, haul their rock to Mt. Pleasant, some 13 miles, where it is loaded for railroad shipment. The other large plants belonging to fertilizer companies are considerably more active than for some time, so that there is a greater evidence of activity in phosphate mining than this section has seen for a long time. Prices are firm, but market is still quiet, except for lump rock for furnace use, and low grade filler, in both of which occasional spot sales, as well as some ground rock for direct application and special uses, add to the tonnage being shipped against routine contract withdrawals.

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St. Clair Limestone Co., a subsidiary of the Carnegie Steel Co., operating quarries at Gannister near Williamsburg, Penn., recently increased its force of workmen to 140 men. The quarries are operating six days a week and are shipping rock to the steel company.

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Quinn Lime Co., Ainsworth, Neb., is a new project recently launched by Clayton Quinn and his son. Pulverized limestone is the product it is proposed to market at the present time.

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Canon City, Colo.; Through a sheriff's sale, it was reported that bond holders of the Mountain Gross Co., the Mountain Gross Granite Corp., and the United States Gypsum Co. have obtained title to $101,274 worth of land held by the firms in Fremont and Chaffee counties.

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Illinois: Farmers are increasing their use of limestone at a rate which has not been duplicated for several seasons, it is reported by C. M. Linsley, soils extension specialist of the college of agriculture, University of Illinois. Illinois farmers lead the United States in the spreading of limestone to correct soil acidity, but during the last several years the use of this material has fallen off even in this state. During the last 15 years a total of more than 7 million tons has been used by farmers following the recommendations of county farm advisers and the extension service of the U. of I. college of agriculture for the testing of soils, the growing of more legumes, and the balancing of cropping systems. In one county alone, Montgomery, 49 carloads of limestone were ordered in August, and in July the orders exceeded the total for the entire past year, according to reports from Farm Adviser A. E. Snyder. He estimated that the program of the last 15 years had added at least another $50,000 conservatively estimated, to the value of the county's wheat crop this year.

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Lake Mills, Wis., has quit crushing stone for its own use, having crushed a supply sufficient to meet all local road needs for years to come.

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Sand and Gravel

Topeka, Kan.: Mark Bridges, inspector and accountant in the state board of administration, recently said that royalties on sand and gravel taken from the two navigable streams of the state showed an increase of 50% in 1934 over 1933.

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Muscatine, Ia.: Contracts to Otto Wendling for $17,565.40 and the Automatic Gravel Co. for $14,184.20 were recently awarded by the county board of supervisors for 30,000 cu. yd. of crushed rock and gravel. The Wendling contract is for work relief labor, while the contract with the Automatic is a flat price on the road. A $4900 job, involving 3000 yd. of rip-rap rock, was also awarded to Wendling.

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Ohio River Sand and Gravel Co., Parkersburg, W. Va., recently received $68,224 refund on income, estate and miscellaneous taxes from the federal government.

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Greenville, Miss.: Fire restroyed a dredge of the Greenville Sand and Gravel Co., Feb. 19, with a loss estimated at $25,000.

Phosphate Rock

Statistics: According to the U. S. Bureau of Mines, domestic phosphate rock in 1934 showed gains of 16% over 1933 in total mine production (2,677,277 long tons) 15% in total tonnage shipped or used (2,876,095 long tons) and 28% in total value of shipments $10,039,422). In 1934 phosphate rock was produced and shipped in Florida, Idaho, Tennessee, and Virginia; shipments from Florida and Tennessee amounted to more than 95% of the total. Total stocks in producers' hands on December 31, 1934, (785,047 long tons), declined 21% compared with the preceding year. The average value of the rock, per long ton, at the mines in 1934 was $3.49; in 1933 it was $3.16. No imports of phosphate rock or apatite were recorded during the first 11 months of 1934.

Phosphate rock exported from the United states in the first 11 months of 1934 was as follows:

	Long tons	Value
High-grade rock	75,612	$ 522,700
Land pebble and other...	814,312	3,940,342
Total exports	889,924	$4.463,042

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Publications Received

Limestones of Pennsylvania; by Benjamin L. Miller, professor of geology, Lehigh University; Bulletin M20 of the Pennsylvania Geological Survey, Bureau of Publications, Department of Property and Supplies, Harrisburg, Penn., price $2.00. This volume is approximately double the size of the report published in 1925, which edition was partly distributed when fire broke out in the Division of Documents building and destroyed the remaining copies. The present edition was published and copyrighted in 1934, in response to the demand for information about Pennsylvania limestones. The purpose of the issue is to furnish information concerning the limestones of the state to persons or firms interested in their utilization. In addition to a world of general information, the issue contains detailed information concerning the limestones in each county. The writer has drawn freely upon published and manuscript reports of other geologists, especially present members of the state geological survey.

Characteristics of Rock Wool Experimentally Prepared from Rock Available in the St. Davids-Thorold District, Ontario; by M. F. Goudge, Memorandum Series 62, Department of Mines, Ottawa, Canada. In 1931 research was conducted to discover the possibilities of making rock wool from the rock materials in the Niagara Peninsula of Ontario. The results of these tests definitely indicated that certain large deposits were suitable for its production. This paper describes the rock used in blowing tests, the method of making the blowing tests, the characteristics of the wool produced in the laboratory, the commercial scale test, the characteristics of the wool produced in the commercial scale test and gives a table of the thermal conductivity of the rock wool produced. The paper concludes by summing up the conditions necessary for the production of rock wool of uniformly good quality, and listing newer fields for which the product can be used.

Mineral Resources of the United States: 1931; Part 2, Nonmetals. U. S. Government Printing Office, price $1. This is the annual summary of statistics of nonmetals, published piecemeal by the U. S. Bureau of Mines, now made available in book form about two years after they are of any special interest.

A Study of the Properties of Mortars and Bricks and Their Relation to Bond. By L. A. Palmer and D. A. Parsons. U. S. Bureau of Standards Research Paper RP683. One of the authors, L. A. Palmer, is a member of the staff of the National Lime Association, and at last year's annual meeting of the association (Rock Products, June, 1934) he gave a digest of this report, which covers a study of the water retaining capacity, transverse and compressive strengths, sorption, volume changes and moduli of elasticity of 50 mortars, and characteristics of brick and mortar assemblages. The mortar cements are described but not mentioned by brand name. There are 13 conclusions, which are not very conclusive, and these are qualified as "not final."

Proceedings of the Thirteenth Annual Meeting of the Highway Research Board. Roy W. Crum, Director, Highway Research Board, Waverly Press, Inc., Baltimore, Md. This book of 410 pages gives the complete reports presented in Dec. 1933, on all phases of highway research.

Properties of Mortars and Concretes Containing High Silica Cements; by R. E. Davis, R. W. Carlson, J. W. Kelly and G. E. Troxwell. Authorized reprint from copyrighted Journal of the American Concrete Institute, 7400 Second Boulevard, Detroit, Mich. This short pamphlet was introduced with the purpose of describing briefly the past use and the properties of high-silica cements, and to present in greater detail the results of investigations either completed or now under way in the Engineering Materials Laboratory of the University of California.

The Geology and Ore Deposits of Sierra County, New Mexico; by G. T. Harley. Bulletin No. 10, New Mexico School of Mines, price 60c. Sierra County, a very small one, has been one of the largest producers of mineral wealth in the state of New Mexico. To those interested in seeking out and operating small mining properties, the potential mineral wealth of this area is a matter of great interest. This bulletin was prepared primarily for the use and information of prospectors, owners and operators of mining property in Sierra County, and as a guide to those non-residents who are seeking an outlet for funds through the development of the metallic resources of the region. This presentation therefore is simplified and technical phraseology and highly scientific aspects are minimized.

Annual Report for the Year 1933. Colorado Bureau of Mines, Denver, Colo. The four inspectors visited practically all of the operating metal mines, quarries and tunnels at least once during the year. This paper is an endeavor to answer inquiries regarding the mines and mineral resources of the state.

Portland Cement. By A. C. Davis, works managing director, Associated Portland Cement Manufacturers, Ltd., published by Concrete Publications, Ltd., London, England, price 30 shillings, net. The author probably has had more actual experience in cement manufacture than previous authors of text-books on portland cement manufacture and he has produced a book that will be interesting and helpful to all cement manufacturers, while at the same time sufficiently general and comprehensive to meet the needs of a text-book for the less informed.

Chapter headings give an idea of the treatment: (1) development of portland cement manufacture (historical); (2) portland cement industry today—elementary definitions, statistics, etc.; (3) raw materials, varieties available, proportioning, transporting, mixing, drying, analysis, etc.; (4) estimation and analysis of raw materials; (5) proportioning and preparation; (6) preliminary crushing and grinding; (7) transporting and elevating; (8) burning or calcining—early history; (9) rotary kiln; (10) measuring and recording instruments for kiln control; (11) chemical reactions; (12) heat balance; (13) waste-heat boilers; (14) coal grinding; (15) clinker grinding; (16) dust collection; (17) power; (18) packing and shipping; (19)-(28) sampling, chemical analyses, testing, uses, etc.

It will be seen that the treatment is logical, but descriptive rather than mathematical or statistical. One would hope to find in a book of this character by such an author much valuable operating data. The chapter on measuring and recording instruments is especially interesting because, apparently, the British have gone much farther than manufacturers in this country to develop instrumental control of kiln operation. The book as a whole gives the impression of being a compilation of available information rather than a record of the actual operating experience of an operating man.

Battelle Memorial Institute. This bulletin is published to give an outline of the institute's service to industry, and to show its facilities (illustrated) for this service. The pamphlet is very well illustrated, showing the overall building, libraries, laboratories, and shops. This institute which is located at Columbus, Ohio, is endowed for scientific research in metallurgy and fuels and allied fields, conducting research for industry on a non-profit basis. It is said that research services are rendered to the industry at a very low cost, and that the utmost secrecy is guaranteed if the sponsor so desires.

THE INDUSTRY

New Incorporations

Mixed Concrete Corp., Columbus, Ohio. Incorporators, W. E. Anderson and C. E. Haines.

Mishkin Sand Co., Brooklyn, N. Y. Incorporator, Harry Mishkin.

Sunbeam Fluorspar Co., Elizabethtown, Ill. 100 shares p.v. Incorporators, R. S. Tems, L. Frankel and J. A. Watson.

American Graded Sand Co., Chicago, Ill. 100 shares class A. Incorporators, Henry J. Wenske, Herbert Wenske, Edward Piper.

Leon Sand and Gravel Co., San Antonio, Tex. Stock $1,000. Incorporators, C. M. Schoenfeld, L. H. Haring and Ralph G. Bonnett.

Eastern Cement Stone Co., Malden, Mass.; 1000 shares, no par value. Incorporators are David O'Rourke, 87 Lawrence St.; Elsie L. Cordingley, and Alice M. Keating.

Nyack Sand and Gravel Corp., Albany, N. Y. Capital $10,000, divided into shares of stock of $100 par value. Directors, Anthony and Anna Marsilio, Nyack, and Vincent Glaquento.

Winterset Limestone Co., Des Moines, Iowa. 100 shares capital stock without par value. Incorporators, B. S. Smith, W. S. Wing, G. D. Pitts, R. A. Bechtold, W. M. Bennett, Jr., O. C. Hunt and George Kilian.

Obituaries

C. Dewitt Graham, who had been connected with the National Gypsum Co., Buffalo, N. Y., died at his home in Philadelphia on January 16.

M. P. Martin, a salesman for the Lehigh Portland Cement Co., Allentown, Penn., died February 12 at South Highlands Hospital, Birmingham, Ala.

Doyle A. Stout, 53, chief engineer of the mines and quarries of the Colorado Fuel and Iron Co., died in Pueblo, Colo., February 10. Mr. Stout had been with the company for 23 years.

C. P. Steventon, purchasing agent of the International Cement Corp., New York, N. Y., died at Bronxville on February 12. Mr. Steventon studied at Harvard University and served as a radio operator in the navy during the war.

Ben F. Dickinson, secretary and treasurer of the Big Rock Sand and Material Co., Little Rock, Ark., died January 30. Mr. Dickinson, a graduate of the University of Arkansas, was active in civic and business affairs of Little Rock.

C. H. Boynton, formerly general superintendent of the Associated Press, died at his home February 11. Mr. Boynton was assistant to the president of the Universal Atlas Portland Cement Co., Chicago, Ill., from 1921 to his retirement in 1930 because of ill health.

R. E. Paine, treasurer, secretary and director of the Aetna Portland Cement Co., Detroit, Mich., and a director of several other corporations, died at his home on January 27. Mr. Paine, a Harvard graduate, was socially prominent in Boston, belonging to numerous social and civic organizations.

J. H. Browne, executive in charge of sales of insulating board for the United States Gypsum Co., New York, N. Y., died at his home February 11. Mr. Browne joined the gypsum company recently when the Wood Fibre Products Co., of which he was the president, was acquired by the gypsum company.

Frederick K. Irvine, president of the Chicago Structural Tile Co., Lemont, Ill., died on February 10. Mr. Irvine attended Transylvania University (now Kentucky University), where he was editor of the college paper at the age of 15. He chose to become a writer and was connected successfully with the Kentucky Gazette, the Louisville Courier-Journal, the Cincinnati Enquirer, and the New York Times. He later became a partner of Edgar H. Defebaugh in the publishing of the trade magazine, *Barrel and Box*. While traveling on the surveys of this field, the groundwork was laid for the founding of the trade magazine, *Rock Products*. In 1910 he helped to perfect an invention of concrete building tile, after which he organized the Chicago Structural Tile Co. He was a life member of the Art Institute of Chicago and the Hamilton Club and had numerous fraternal connections at the time of his sudden death.

The late Frederick K. Irvine

Personals

T. J. Cummings, Jr., was appointed trustee recently to liquidate the property of the Central Kansas Quarries, east of Ottawa, Kan.

J. F. Gorman, president-treasurer of the Federal Lime and Stone Co., Cleveland, Ohio, is a candidate for the democratic nomination for mayor.

George E. Warren, vice-president of the Southwestern Portland Cement Co., Los Angeles, Calif., was recently named president of the Construction League of Dayton, Ohio, at a meeting of its board of directors.

Cement

Aetna Portland Cement Co., Detroit, Mich., is to resume operations at its Bay City, Mich., plant some time before May 1, its usual reopening time, according to E. A. Harris, plant manager.

Universal Atlas Cement Co., Chicago, Ill., and the **Lone Star Cement Co.,** Albany, N. Y., recently set March 1 as a tentative date for resumption of operations. Repair work has been under way for the past few weeks.

Sand and Gravel

Gravel pits were recently opened at Farmington, Iowa, and near McAllister, Wis.

Stony Creek gravel plant at Orland, Calif., was recently purchased by E. B. Bishop, Sacramento contractor.

In preparing an ordinance to authorize Chillicothe, Ohio, to contribute $1300 to FERA projects, the city council proposed that cash be contributed for screens in developing the **Poplar Street Gravel Pit.**

The sand tipple owned by the city of Sciotoville, Ohio, was to resume operations to supply city projects with sand, in February, after an enforced idleness due to the high stage of the Ohio river.

Lime

Three work relief projects were to start recently to provide farmers in Columbia county, Wis., with limestone at a cost of from 70c to 85c a ton. Two lime quarries are also being opened up near Clarion, Ohio, which are expected to lighten the relief rolls considerably.

Quarries

The county rock quarry, located near the south city limits of Waverly, Iowa, was to be reopened early in February, after being shut down since January 7 while the county was being organized under the Iowa Emergency Relief Administration. Between 15 and 20 men will be employed on one 8-hour shift at a wage rate of 30 cents per hour.

The crushing of limestone at the Stussy quarry south of Mantorville, near Claremont, Minn., was started January 15 by relief workers. The limestone is to be used by farmers.

Seventy-seven relief men from Lime City, Clarence and Stone Mill, south of Tipton, Iowa, started to crush limestone early in February for use on the highways of Cedar county.

A rock crusher was being placed in position on the George Bryant farm near Hamilton, Mo., in January. A crusher was also set up on the Robert Duston farm by Hamilton township.

The Lee county engineering department was recently considering the establishment of a stone quarry on the Henry Wilbert farm near Wever, Iowa, to supply crushed stone for county roads.

Lawrence County, Mo., recently purchased a rock crusher to be used in preparing material for the roads of the county. The order was placed with the Ballin Iron Works and the payment was $1666.

Eight thousand tons of limestone have been taken from quarries in La Crosse County, Wis., by WERA laborers since August, according to a recent report of the county WERA work secretary.

A crushing unit was purchased and moved to Keytesville, Mo., late in January, to crush rock for road material for Keytesville township. It was placed at Price Bridge on old Chariton where there is a stone quarry.

The Chris Katz rock quarry near Seneca, Kan., was recently approved by KERC and will be worked by the county. The quarry is to be worked by relief labor, and the material is to be placed in stock piles to be used as needed.

The county rock crusher, located near Coffeyville, Kan., recently was put in operation. The crushed rock was hauled by truck to the Buckeye St. project. When this project is finished, other Parker township roads are to be surfaced.

The Craig farm rock crusher has been running at full capacity near Armstrong, Mo., to supply material for the city streets. Work of hard surfacing the streets is to begin as soon as the roads are in condition to truck the crushed rock in.

The county stone crushers were to be placed back into service, January 30, near Ironton, Ohio, to provide work for men on the relief list. The commissioners have appropriated $100,000 for road work and it is anticipated early in March.

Work of removing rock from the Chambers farm south of Howe, Iowa, was to be started late in January. The rock was to be removed by C. A. Emery, who has the contract for surfacing the county trunk road from Stuart south to highway 2.

The Montgomery County board of supervisors appointed representatives on February 12 to confer with state and federal officials in regard to opening the Kiggins quarry near Litchfield, Ill., in order to furnish work for unemployed.

The rock crusher acquired for use in surfacing the streets in Horton, Kan., remained idle for some time in January waiting for repairs. Hundreds of tons of rock were piled on the city lots at Eighth St. and Second Ave. West, waiting to be crushed and used on unsurfaced streets.

The rock crusher located at Sigourney, Iowa, was to be moved early in February to the Cady quarry south of town where FERA workmen have uncovered a great deal of rock which is ready for quarrying. The rock will probably be sold at cost to private parties, to be used for surfacing the streets in front of their homes.

Stewart rock quarry, near Amazonia, Mo., has been working since January 15 with laborers supplied by the Andrew county reemployment office. The material is being hauled for the Knudson Contracting Co., which has the contract for culvert building on the three projects on route SK from 275 south to the Buchanan county line.

The Quartzite Stone Co., Lincoln, Kan., was to have a full crew of 75 men on the job February 1 to begin filling their contract to supply 4000 tons of crushed rock to the state highway department. The stone was to be hauled to Ellsworth, where it was to be used for surfacing three miles of 40-S. It was estimated that 12 days would be required for the filling of the contract.

The Grace Hill rock quarry, near Washington, Iowa, was to be opened February 4, pending approval from the state emergency relief office at Des Moines. The program was to call for using approximately 75 men. Rock was to be quarried for the surfacing of nine miles of road, which had been graded in the summer of 1934 and which will probably require three months' work.

The third annual safety banquet of the Ste. Genevieve Lime and Quarry Co., Ste. Genevieve, Mo., was held January 19.

Fisher quarry, near Camas, Wash., was being repaired early in February to prepare for supplying rock for the new Columbia river jetty project.

The rock quarry on the Scholz land north of Snipe Creek school house, near Marysville, Kan., has been opened to furnish material for a county road.

Caldwell Stone Co., Danville, Ky., has purchased the Kentucky River quarry, one mile south of the Boonesboro bathing beach; a $30,000 building program is planned.

All quarries in Rock County, Wis., are being worked by relief labor on the lime grinding project to supply farmers with agricultural limestone for 26c a ton.

Route A rock quarry, three miles north of the Fayette–Harnsburg road, near Fayette, Mo., has been reopened under an FERA project to furnish rock to surface that road.

Officials of Lawrence, Kan., were in Topeka late in January conferring with highway officials in regard to placing a crusher in the state park for graveling roads there.

The city council of Elberton, Ga., recently voted to purchase a rock crushing plant for the city, to be used in crushing the waste granite accumulating at the local finishing plants.

Rinker Sand and Stone Co., West Palm Beach, Fla., recently moved into a new dock location between the Flagler bridge and St. Ann's Academy grounds, on the west side of Lake Worth.

Work relief crews were employed recently in two pits near Muscatine, Iowa. The men were occupied in stripping and blasting in preparation for crushing when the road would be ready for surfacing.

Steam shovel and other equipment used at the government rock quarry near Howe, Neb., has been moved to the Gould farm east of Humboldt. Rock will be shipped by train to Missouri River points.

Cook rock quarry, near King City, Mo., was opened January 28, marking the beginning of Gentry county's $80,000 project. Rock is to be taken from four quarries to be crushed for new farm-to-market roads to be started this year.

A new rock crusher was purchased late in January by the city of Cameron, Mo. The road from highway 36 to the reservoir was to be graveled first, after which the gravel was to be used on city streets in the residence districts, at a cost of $5.00 to the property owners for a 50-ft. lot.

The crusher plant on Happy Hill near Pleasant Hill City, Mo., resumed operations early in January after a shutdown due to weather conditions. The state highway department is operating the plant in the production of some 6000 yd. of rock to be used on No. 58.

Rebuilt rock crusher began operation recently at the city barn in Brownwood, Texas. Because it was found cheaper to crush the rock locally, it became possible to improve the city streets. Crushed rock is produced for less than 75c a yd. and twelve men are employed.

A power shovel arrived at Mt. Pleasant, Iowa, in January and was to be put into operation immediately, stripping. As this work advances, other machinery was to be moved in for getting out the stone and hauling to crushers established by the $25,000 federal allotment to the county.

The crushing of limestone for Walworth county, Wis., has been resumed at the Allen's Grove and Whitewater pits. Relief labor is being used and the WERA is furnishing the cost of crushing and a portion of the trucking. Each farmer is limited to 50 tons of limestone at 30c per ton at the pits.

A rock crusher, joint enterprise of the Marshall special road district and the city of Marshall, Mo., started operations January 28. Under the agreement the city is to get one-third of the crushed rock. Considerable stripping was necessary, but work was expected to proceed rapidly in favorable weather.

Scott farm quarry, Ridgeway, Mo., is being worked to furnish stone for surfacing the road running east from the city. A new rock crusher was set up. The road will be graveled to a width of 18 ft., with a possibility of adding shoulders, if the state will take it over.

The state supervisor recently approved three rock crusher projects in the vicinity of Knob Noster, Mo. One quarry will supply crushed rock for the streets of Knob Noster and for a road running west of town. A committee has been appointed to collect money from property owners for the graveling of the city streets.

The county court of Buchanan county, Mo., was recently requested to supply a rock crusher as its part in a program to cover a number of county roads with rock. Patrons expressed a willingness to co-operate by donating the rock and furnishing some of the trucks and labor. If the plan is accepted, FERA labor will probably be furnished.

A new rock quarry was to have been opened in Cass county near Ottumwa, Iowa, in January to replace the old one in Ottumwa which is nearly worked out. The emergency relief administration and the county have purchased a narrow-gage railroad outfit to supply the two crushers. The rock is to be used to supply road surfacing material.

The quarries in the vicinity of Holman, Barre Mills and Bangor, near La Crosse, Wis., resumed operations late in January after snow drifts were cleared away by the men. The men employed are those with delinquent taxes, at least 50% of their wages being returned to the county treasurer for application on delinquent taxes. The stone quarried is to be crushed and used to improve county trunk highways.

Cement Products

Cambridge Cement Stone Co., Boston, Mass., received a contract for cast stone on the addition to the infirmary in Andover for Phillips Andover Academy.

A "handful" of superintendents: After several trials and many failures Rock Products' fieldman, Jimmy O'Day, has got his camera so he can get a picture now and then. Here's a sample handful. From left to right: W. M. Jones, superintendent, Consumers Co., McCook plant, LaGrange, Ill.; S. J. Sinden, superintendent, Utica Hydraulic Cement Co., Utica, Ill.; John Gibbons, general manager, East Peoria Sand and Gravel Co., East Peoria, Ill.; M. E. McLean, superintendent, East St. Louis Stone Co., East St. Louis, Ill.; J. C. Showalter, general manager of two stone quarries, Blue Ball, Penn.

Manufacturers

Hardinge Co., Inc., York, Penn., has recently announced a new classifier in bulletin No. 39 for use in the laboratory and small mill.

Interstate Amiesite Co., Inc., Wilmington, Del., announces that on and after March 1, 1935, its executive offices will be removed to the Delaware Trust Bldg., Suite M-204, Wilmington, Del.

Ohio Forge and Machine Corp., Cleveland, Ohio, recently announced the appointment of **The Denton and Anderson Co.,** 1225 W. Washington Blvd., Chicago, as its representative in the Chicago territory.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., announced the recent removal of its Pittsburgh, Penn., district office to 2037 Koppers building. Mr. G. V. Woody is manager of the Pittsburgh district.

Hercules Powder Co., Wilmington, Del., recently announced the appointment of E. H. Sykes as representative of the *Explosives Engineer* with offices at 905 American Bank Bldg., Pittsburgh, Penn.

Ideal Electric and Manufacturing Co., Mansfield, Ohio, announced the recent appointment of R. P. Tarbell as manager of the company's welding division. Mr. Tarbell has been in the welding industry since 1918 with several large companies.

Bucyrus-Erie Co., South Milwaukee, Wis., recently appointed H. S. Freeman as Loadmaster distributor for the western portion of the state of New York. John Bouchard and Sons Co., Nashville, Tenn., was appointed as Loadmaster distributor for central Tennessee.

The Osgood Co., Marion, Ohio, and several other Ohio companies recently sent a telegram to each member of the House of Representatives for the state of Ohio showing their interest in having government competition with established sand, gravel and stone producers stopped.

SKF Industries, Inc., Philadelphia, Penn., has announced the recent opening of a new branch store at 407 South 4th Street, Minneapolis, Minn. The new office carries a complete stock of SKF ball and roller bearings, pillow blocks and hangers, and is under the supervision of A. Kishkunas.

Macwhyte Co., Kenosha, Wis. J. S. Whyte, vice-president and general manager, was recently elected to the Board of Governors of the National Aeronautic Association.

Worthington Pump and Machinery Corp., Harrison, N. J., has consolidated several of its contributing sales divisions into one mining and construction department, under the management of W. A. Neill, with headquarters at Harrison.

Link-Belt Co., Chicago, Ill., has announced several promotions in its sales organization. W. L. Hartley has assumed the position of manager of foundry equipment sales, with headquarters in Chicago, and H. L. Hoefman, former manager of the Indianapolis branch, has succeeded Mr. Hartley as manager of the Detroit office. R. B. Holmes is now manager of the Indianapolis office, and C. A. Blomquist has succeeded him at St. Louis.

Trade Literature

Screens. Bulletin No. 93 of three pages illustrates and describes the features of "Vibrex Screens." ROBINS CONVEYING BELT CO., New York, N. Y.

Cone Crushers. Standard and short head types for fine reduction crushing are both included in Bulletin 66, 24 pages. NORDBERG MFG. CO., Milwaukee, Wis.

Wire Rope. Twenty-page illustrated booklet with the title "What You Should Know About Flex-Set Preformed Construction Wire Rope." BRODERICK AND BASCOM ROPE CO., St. Louis, Mo.

Fuel Pulverizers. Installations and engineering data on pulverizing fuel equipment treated comprehensively in 24-page booklet. FOSTER WHEELER CORP., New York, N. Y.

Drilling Tools. File size catalog, liberally illustrated, gives tool data and prices as well as instructions for sharpening bits and splicing cables. Bucyrus-Erie engineering achievements of 1934 are outlined in a pocket-size 64-page booklet. BUCYRUS-ERIE CO., South Milwaukee, Wis.

Lubricators. The Stapax lubricator, a self-contained unit designed to replace waste packing in journal boxes, is described in a 4-page leaflet. LUBRICATION PRODUCTS CO., Cleveland, Ohio.

Pyrometers. Bulletin 50, a leaflet, features the "Pyro Immersion Pyrometer." PYROMETER INSTRUMENT CO., New York, N. Y.

Drives. The Griffin "Jet'n Drive," built to lower water and overhead, is described in 4-page bulletin. GRIFFIN WELLPOINT CORP., New York, N. Y.

Drills. A new heavy sinker drill, "CP-52," is introduced in a colorful four-page folder. Emphasis is laid on this drill's adaptability for heavy sinking, dry and wet. CHICAGO PNEUMATIC TOOL CO., New York.

Centrifugal Pumps. Three-page bulletin gives the list of parts, specifications and illustrations of the Type R single-stage volute pumps. WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J.

Rollers. Eight-page bulletin, No. 1351, describes and illustrates the action of the "Roll-A-Plane" in producing smooth road surfaces efficiently and economically. AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Ill.

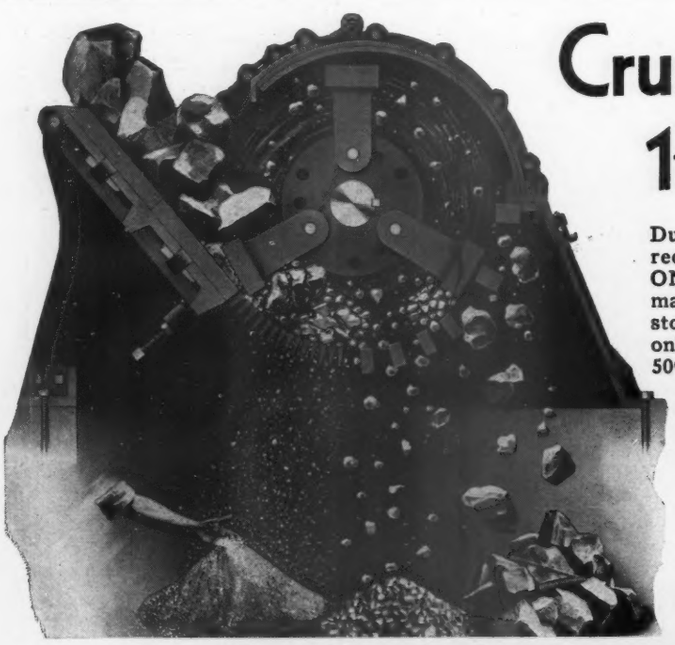
Motor Cooling-Systems. Bulletin W-90 is a 4-page illustrated pamphlet, listing the troubles caused in motors by bad water in the cooling system, and describing how to counteract these troubles. RATHBUN CO., INC., El Paso, Tex.

Quarry Machinery. Telsmith Bulletin No. 266-J, 32 pages, is a catalog of mining, quarry, and gravel pit machinery. It contains a new table for figuring capacities of vibrating screens. SMITH ENGINEERING WORKS, Milwaukee, Wis.

Bearings. Up-to-date information on roller bearings, with a complete listing of line sizes, is given in a 32-page catalog. Half-tone reproductions and line drawings show various bearing mountings. BANTAM BALL BEARING CO., South Bend, Ind.

Hydraulic Packings. The reasons for hydraulic packing failures, with illustrations, are discussed in a four-page bulletin released by Chicago Belting Co. The necessity for individual-condition analysis by engineers is cited. CHICAGO BELTING CO., Chicago, Ill.

Motors. Bulletin No. 507, describing direct current motors; bulletin No. 510, describing totally-enclosed fan-cooled motors; and bulletin No. 514, describing single phase capacitor motors have been printed recently in colors, with engineering and other data. LOUIS ALLIS CO., Milwaukee, Wis.



Crushes 36" Rock to 1¼" in One Operation

Due to their ability to handle power shovel loaded rock and reduce to commercial sizes in ONE OPERATION WITH ONE CRUSHER, Williams Hammer Crushers have shown remarkable savings in many quarries. By handling the large stone much sledging and secondary blasting is avoided. As only one crusher is required there is a saving in investment of 50% to 75% as you also save in smaller buildings, fewer foundations, conveyors, drives and motors. A cubular product free from slivers and slabs is another Williams advantage. Let us tell you about a Williams for your work. A size for every job. Capacities 3 to 300 tons per hour.

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OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD

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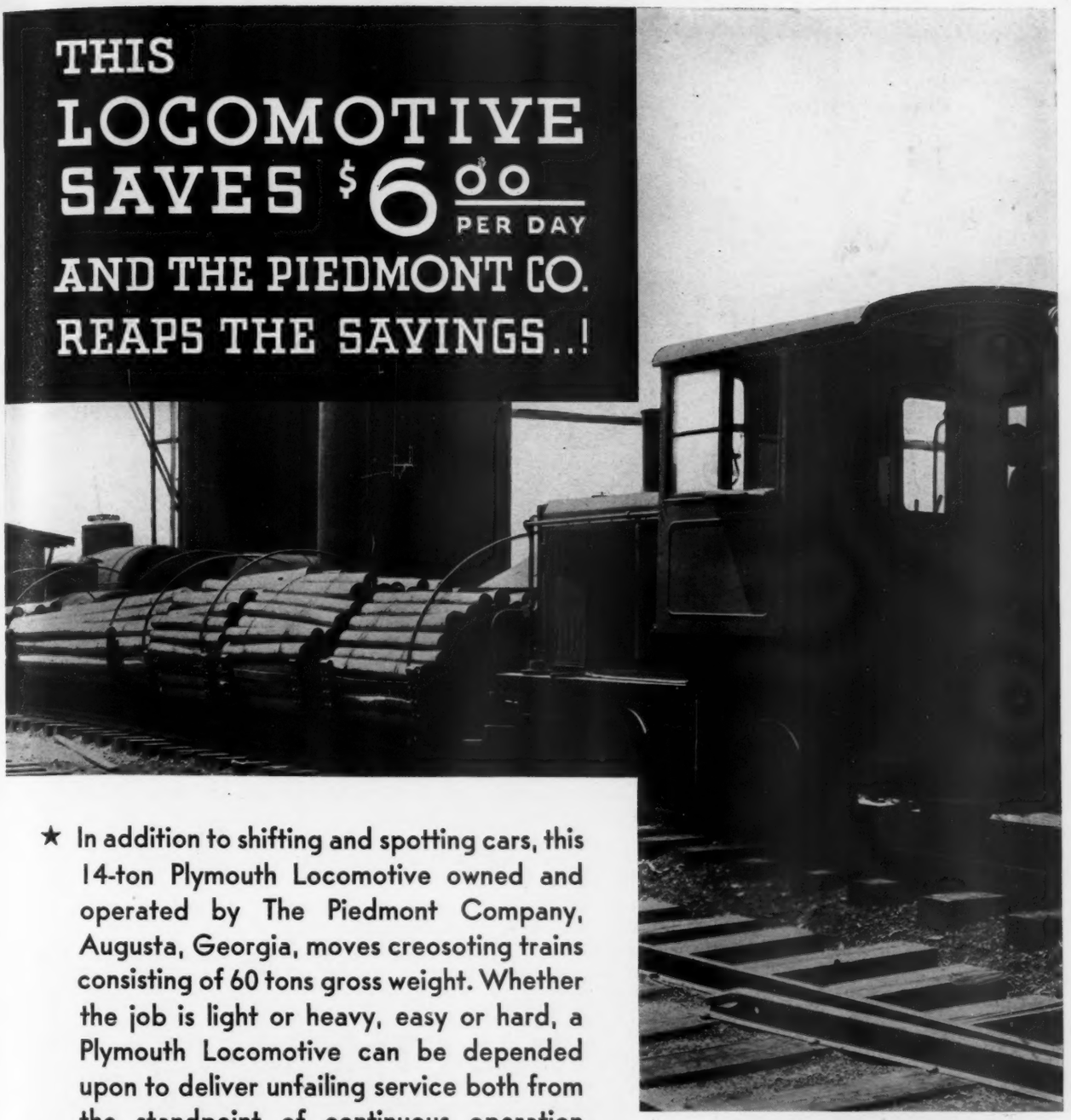
THIS LOCOMOTIVE SAVES $6.00 PER DAY AND THE PIEDMONT CO. REAPS THE SAVINGS..!



★ In addition to shifting and spotting cars, this 14-ton Plymouth Locomotive owned and operated by The Piedmont Company, Augusta, Georgia, moves creosoting trains consisting of 60 tons gross weight. Whether the job is light or heavy, easy or hard, a Plymouth Locomotive can be depended upon to deliver unfailing service both from the standpoint of continuous operation without breakdown and low cost maintenance. The saving of $6.00 per day estimated by The Piedmont Company roughly figures $1800 per year. Let us send you a copy of the Plymouth Locomotive Bulletin!

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LOCOMOTIVES

PLYMOUTH LOCOMOTIVE WORKS, PLYMOUTH, OHIO, U.S.A.

INVESTIGATE this New Process!

Dipper teeth rebuilt for $50 which was less than the cost of the original ones, yet they have outworn them 100 per cent.

Worn-out pump shell rebuilt and work hardened for approximately half the cost of new ones, yet it gives 25% to 50% longer wear.

Your Old Worn Out Castings Rebuilt with NICKEL-MANGANESE

—will actually last **two or three times** as long as the original steel parts. This vastly increased service life is accomplished by the special McLean process of treating the metal.

First: The rebuilt portion, made of the best nickel-manganese steel, is thoroughly **work hardened** to a maximum before the hard surfacing is applied.

Second: This toughened base metal is then **hard surfaced** with wear-resisting alloy steel, producing a super-tough tool-steel point or surface.

The complete "build-up" is tough clear through. It can take the shock and stress **inside** as well as the wear and tear **outside.** It will not wear, chip off or break under the hardest conditions.

Chilled iron crusher head rebuilt with nickel-manganese steel, giving equal service of new manganese head, at far less cost.

Read This Letter

"Regarding the serviceability experienced on a set of steam shovel dipper teeth, which your shop built up to dimension with nickel manganese and hard surfacing rod, I am advised by the superintendent at our Thornton quarry that these teeth gave us double the yardage commonly experienced with new manganese cast teeth before becoming dull past the point of serviceability."
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Let us quote you on your requirements. We apply hard facing and wear resisting alloys to meet your special repair needs on dipper teeth, pump shells, crusher heads, and other equipment. **Rebuilt work costs less and lasts longer than new parts.**

Write for Bulletin

which gives details and applications of the McLean process

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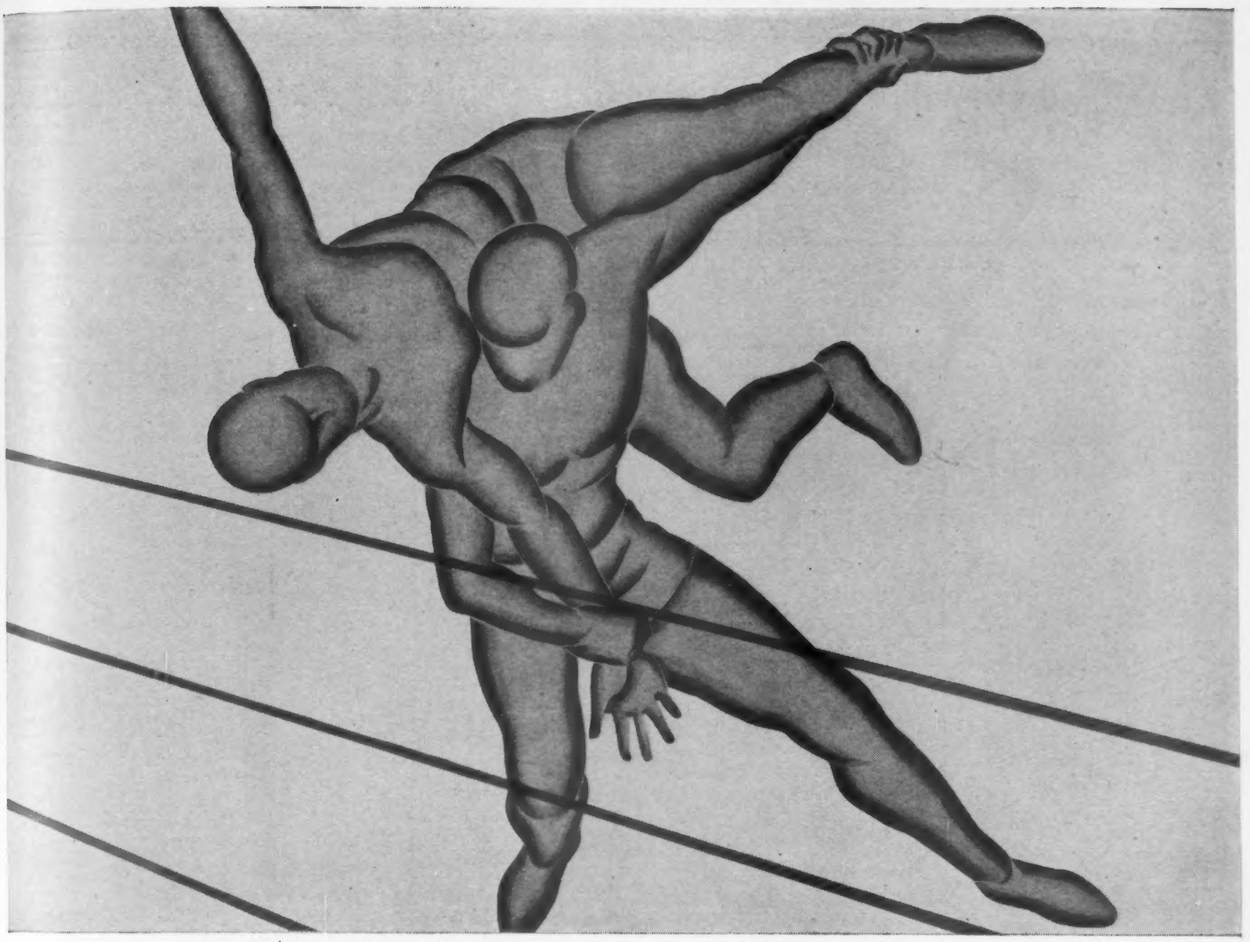
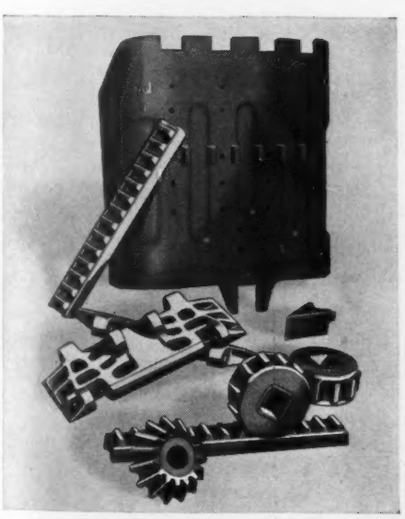


IT PAYS TO BE TOUGH!



To provide the necessary stamina for Marion Excavators, alloy steels are used extensively in their construction . . . Crawler shoes and crawler sprockets—dipper fronts and dipper teeth—shipper pinions and dipper handle racking are manganese steel—the toughest and most durable material known for these important parts . . . Axles, shafts and pins, subject to high torques and heavy loads, are chrome, molybdenum, nickel, or vanadium steel alloys to insure maximum strength and stress with minimum weight.

THE MARION STEAM SHOVEL CO. *Marion·Ohio*

SHOVELS • CLAMSHELLS • DRAGLINES • CRANES • GAS • DIESEL • ELECTRIC • GAS ELECTRIC • DIESEL ELECTRIC • STEAM

AN EXCAVATOR FOR EVERY MATERIAL HANDLING NEED

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For alphabetical index, see page 2

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Air Separators
Raymond Bros. Impact Pulv. Co.

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Backfillers
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Bucyrus-Erie Company
Harnischfeger Corp.
Lima Locomotive Works, Inc. (Ohio Power Shovel Co.)

Ball Bearings
S K F Industries, Inc.

Balls (Grinding, See Grinding Balls)

Balls (Tube Mill, etc.)
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Lorain Steel Co.
F. L. Smidth & Co.

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Link-Belt Co.
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Blasting Powder (See Powder, Blasting)

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Cross Engineering Co.
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Link-Belt Co.

Buckets (Clamshell, Grab, Orange Peel, etc.)
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Link-Belt Co.
Wellman Engineering Co.

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Lorain Steel Co.

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Bucyrus-Erie Co.

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Link-Belt Co.

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Lima Locomotive Works, Inc (Ohio Power Shovel Co.)
Link-Belt Co.
Marion Steam Shovel Co.

Cranes (Excavator
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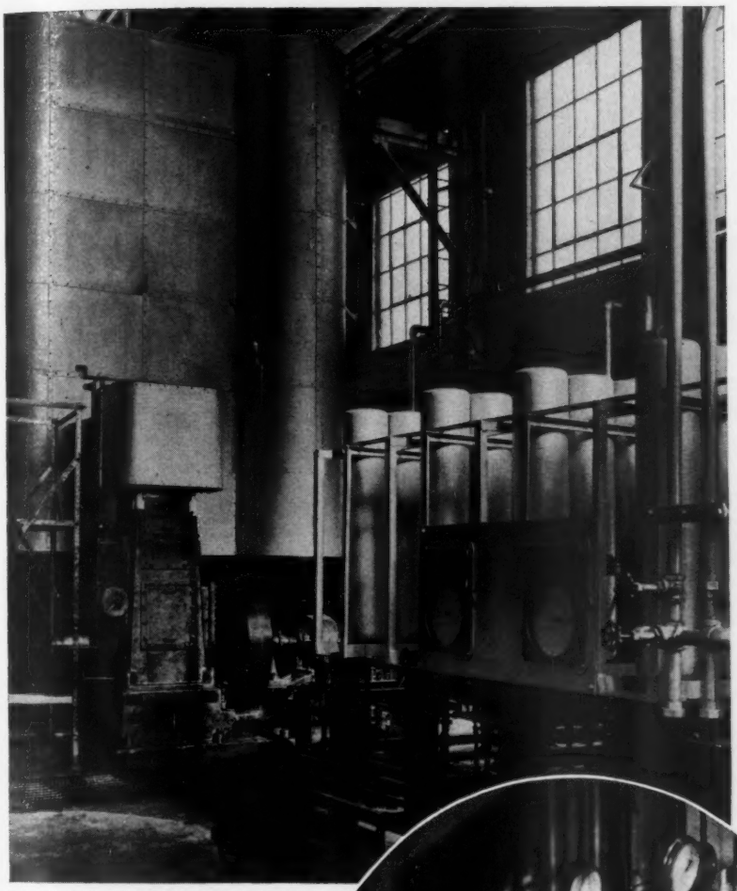
THE *NEW* 100% PENNSYLVANIA *Gulfpride Oil* IS *ALCHLOR* PROCESSED!



Liquid air is distilled in the tall insulated fractionating tower for separation into oxygen and nitrogen. The engine in front of the tower assists in the liquefaction of air prior to its fractionation for the ALCHLOR process

This unparalleled motor oil will give you DEFINITE Operating Savings

IN ADDITION to being a 100% Pure Pennsylvania Oil, GULFPRIDE—the world's finest lubricating oil—is super-refined by Gulf's exclusive and patented ALCHLOR process. This remarkable refining process removes 20 per cent more impurities—such as asphaltenes, petroleum resins, naphthenic acids, etc. Finely dewaxed, highly filtered and ALCHLOR processed—GULFPRIDE is an unparalleled motor oil!

GULFPRIDE'S high mileage performance offers truck and commercial car operators astounding savings on a cost-per-mile basis. It smashes all former ideas of low consumption—saves carbon removal expense, gives longest life, and lowers maintenance costs. GULFPRIDE gives the ultimate motor oil economy.

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During every stage of refining GULFPRIDE Motor Oils test samples are withdrawn to be carefully checked in the laboratory by trained Gulf chemists. GULFPRIDE quality is under constant supervision.

Features of the **NEW GULFPRIDE OIL**

1. Double tough lubricating film.
2. High resistance to heat.
3. Low in carbon, gum and sludge.
4. High viscosity index.
5. Low pour test.
6. High mileage.
7. Lowest cost per mile.

GULF REFINING COMPANY
PITTSBURGH, PA.

DISTRICT SALES OFFICES: BOSTON · NEW YORK PHILADELPHIA · ATLANTA · NEW ORLEANS HOUSTON · PITTSBURGH · LOUISVILLE · TOLEDO

GULF INDUSTRIAL LUBRICATION

GULF REFINING COMPANY, R.P. 3
3800 Gulf Building, Pittsburgh, Pa.

I would like to have complete information and price quotations on the new Gulfpride Oil.

Name.....
Title.....
Company.....
Address.....

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 2

Detonators
Atlas Powder Co.
Hercules Powder Co.

Diaphragms (Pump)
B. F. Goodrich Rubber Co.
Manhattan Rubber Mfg. Co.

Dippers and Teeth (Steam Shovel)
Bucyrus-Erie Co.
The Frog, Switch & Mfg. Co.
Marion Steam Shovel Co.

Dirt Moving Equipt. (Dumptor)
Koehring Co., Division of National Equipt. Corp.

Ditchers
Bucyrus-Erie Co.
Harnischfeger Corp.
Marion Steam Shovel Co.

Draglines
Bucyrus-Erie Co.
Harnischfeger Corp.
Link-Belt Co.
Marion Steam Shovel Co.

Draglines (Gasoline or Electric)
Koehring Co., Division of National Equipt. Corp.

Dragline Excavators
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Marion Steam Shovel Co.
Lima Locomotive Works, Inc. (Ohio Power Shovel Co.)

Dragline Cableway Excavators
Bucyrus-Erie Co.
Diamond Iron Works, Inc.
Link-Belt Co.
Marion Steam Shovel Co.
Sauerman Bros.

Dragline Excavators (Walking)
Bucyrus-Monighan Company

Dredge Pumps (See Pumps, Dredging)

Dredges
Bucyrus-Erie Co.
Hayward Co.
Marion Steam Shovel Co.
Morris Machine Works

Dredging Sleeves
B. F. Goodrich Rubber Co.
Manhattan Rubber Mfg. Co.

Drill Bits
Ingersoll-Rand Co.
Timken Roller Bearing Co.

Drill Sharpening Machines
Ingersoll-Rand Co.

Drill Sharpeners
Ingersoll-Rand Co.

Drills
Bucyrus-Erie Co.
Timken Roller Bearing Co.

Drill Steel
Ingersoll-Rand Co.

Drills (Core)
Ingersoll-Rand Co.

Drills, Hammer (See Hammer Drills)

Drills (Rock)
Ingersoll-Rand Co.

Drives (Short Center)
Allis-Chalmers Mfg. Co.

Dryers
Babcock & Wilcox Co.
Bonnot Company
Combustion Engineering Corp.
Hardinge Company, Inc.
Traylor Eng. & Mfg. Co.

Dumptors
Koehring Co., Division of National Equipt. Corp.

Dust Conveying Systems
Fuller Company

Dust Hoods and Helmets
Pulmosan Safety Equipment Corp.

Dynamite
Atlas Powder Co.
Hercules Powder Co.

Electric Cables and Wires
American Steel & Wire Co.
John A. Roebling's Sons Co.

Electric Mine Hoists
Nordberg Mfg. Co.

Electric Power Equipment
General Electric Co.

Engineers
Bonnot Company
Productive Equipment Corp.
F. L. Smidth & Co.

Engines (Diesel)
Ingersoll-Rand Co.
Nordberg Mfg. Co.

Engines (Steam)
Morris Machine Works

Excavating Machinery (See Shovels, Cranes, Buckets, etc.)

Excavators (Crawling Tractor)
Koehring Co., Division of National Equipt. Corp.

Excavators (Dragline)
Koehring Co., Division of National Equipt. Corp.

Explosives
Atlas Powder Co.
Hercules Powder Co.

Fans
General Electric Co.

Feeders
Babcock & Wilcox Co. (Pulverized Coal)
Chain Belt Co.
Diamond Iron Works, Inc.
Fuller Co. (Cement and Pulverized Material)
Hardinge Company, Inc.
Smith Engineering Works (Plate)

Flights
Cross Engineering Co.
J. B. Ehrsam & Sons Mfg. Co.

Furnaces
Combustion Engineering Corp.

Fuses (Detonating & Safety)
Ensign-Bickford Co.

Fuses (Electrical)
General Electric Co.

Gaskets
B. F. Goodrich Rubber Co.
Manhattan Rubber Mfg. Co.

Gasoline
Texas Company

Gears and Pinions
Chain Belt Co.
General Electric Co.
Link-Belt Co.

Gelatin and Semi-Gelatin (See Explosives)

Grapples (Stone)
Hayward Co.

Grease
Gulf Refining Co.
Texas Company

Grinding Balls
Babcock & Wilcox Co.
Lorain Steel Co.

Grizzlies
Productive Equipment Corp.
Smith Engineering Works
Traylor Eng. & Mfg. Co.

Grizzly Feeders
Traylor Eng. & Mfg. Co.

Guards (Wire)
National Wire Cloth Co.

Hammer Mills (See Crushers)

Hard Facing Materials
McLean Welded Products Corp.

Hoists
Harnischfeger Corp.
Ingersoll-Rand Co.
Link-Belt Co.

Hose (Water, Steam, Air Drill, Sand Suction and Discharge)
B. F. Goodrich Rubber Co.
Ingersoll-Rand Co.
Manhattan Rubber Mfg. Co.

Insulation (Electric)
General Electric Co.

Kilns and Coolers (Rotary)
Bonnot Company
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.

Kominuters (See Mills)

Lighters, Hot Wire (For Safety Fuse)
Ensign-Bickford Co.

Lime Handling Equipment
Fuller Company
Link-Belt Co.
Raymond Bros. Impact Pulv. Co.

Lime Kilns (See Kilns and Coolers, Rotary)

Linings (Iron for Ball and Tube Mills). See Mill Liners)

Linings (Rubber for Ball and Tube Mills)
B. F. Goodrich Rubber Co.
Manhattan Rubber Mfg. Co.

Loaders and Unloaders
Bucyrus-Erie Co.
Fuller Company
Link-Belt Co.
Marion Steam Shovel Co.

Locomotive Cranes (See Cranes, Crawler and Locomotive)

Locomotives (Diesel)
Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Diesel Electric)
Fate-Rooth-Heath Co.
Plymouth Locomotive Works

Locomotives (Gas Electric)
Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Geared)
Lima Locomotive Works, Inc.

Locomotives (Oil Electric)
Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Steam, Gas and Electric)
General Electric Co.
Lima Locomotive Works, Inc.
Plymouth Locomotive Works (Gas)

Locomotives (Storage Battery)
General Electric Co.

Log Washer
McLanahan & Stone Corp.
Smith Engineering Works

Lubricants
American Steel & Wire Co. (Wire Rope)
Gulf Refining Co.
Macwhyte Co. (Wire Rope)
Texas Company

Machinery Guards
Harrington & King Perforating Co.

Magnets
General Electric Co.

Manganese Steel Castings
The Frog, Switch & Mfg. Co.

Mechanical Rubber Goods
B. F. Goodrich Rubber Co.
Manhattan Rubber Mfg. Co

Mills, Grinding (Ball, Tube, etc.) (See also Crushers, Hammer)
American Pulverizer Co.
Bonnot Company
Hardinge Company, Inc.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Mill Liners and Linings (Iron for Ball and Tube Mills)
Babcock & Wilcox Co.
Lorain Steel Co.
F. L. Smidth & Co.

Mine Handling Equipment
Chain Belt Co.

Mixers (Concrete)
Koehring Co., Division of National Equipt. Corp.

Motors and Generators (Electric Units)
General Electric Co.
Harnischfeger Corp.

Nozzles (Gravel Washing)
Chain Belt Co.

Oil Burners
Babcock & Wilcox Co.

Oils (Lubricating)
Gulf Refining Co.
Texas Company

Packings (Pump, Valve, etc.)
B. F. Goodrich Rubber Co.
Manhattan Rubber Mfg. Co.

Paint (Asphalt)
Texas Company

Partitions (Wire)
National Wire Cloth Co.

Pavers (Concrete)
Koehring Co., Division of National Equipt. Corp.

Perforated Metal
Chicago Perforating Co.
Cross Engineering Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.
Morrow Mfg. Co.

Plate (Double Corrugated)
Hendrick Mfg. Co.

Plates
Cross Engineering Co.
Hendrick Mfg. Co.

Portable Conveyors
Fuller Company
Link-Belt Co.

"Birds of a Feather—"

Notice the high quality of ROCK PRODUCTS advertising patronage. Then send for the latest circulation figures and note the high quality of ROCK PRODUCTS subscriptions.

Rock Products

With which is Incorporated **CEMENT and ENGINEERING NEWS** Founded 1896

330 S. WELLS STREET, CHICAGO, U. S. A.

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 2

Portable Crushing and Screening Unit
Austin-Western Road Machy. Co.
Diamond Iron Works, Inc.
Good Roads Machy. Corp.
Smith Engineering Works
Williams Patent Crusher & Pulv. Co.

Powder (Blasting)
Atlas Powder Co.
Hercules Powder Co.

Power Transmission Machinery
Chain Belt Co.
S K F Industries, Inc.

Pulverizers (See also Crushers, Mills, etc.)
Austin-Western Road Machy. Co.
American Pulverizer Co.
Babcock & Wilcox Co.
Bonnot Company
Dixie Machy. Mfg. Co.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Williams Patent Crusher & Pulv. Co.

Pumps (Air Lift)
Fuller Company
Ingersoll-Rand Co.

Pumps (Cement)
Fuller Company

Pumps (Cement Slurry)
Morris Machine Works
F. L. Smidth & Co.
A. R. Wilfley & Sons

Pumps (Centrifugal)
Ingersoll-Rand Co.
Kansas City Hay Press Co.
Morris Machine Works
A. R. Wilfley & Sons

Pumps (Dredging)
Bucyrus-Erie Co.
Morris Machine Works

Pumps (Pulverized Coal)
Bacock & Wilcox Co.

Pumps (Sand and Gravel)
Ingersoll-Rand Co.
Kansas City Hay Press Co.
Morris Machine Works
A. R. Wilfley & Sons

Railway Equipment
General Electric Co.

Railways (Electric)
General Electric Co.

Ready Mixed Concrete (Truck Mixer Bodies)
Chain Belt Co.

Respirators
Pulmosan Safety Equipment Corp.

Road Machinery
Harnischfeger Corp.
Industrial Brownhoist Corp.
Koehring Co., Division of National Equipt. Corp.
Marion Steam Shovel Co.

Rock Bits (See Drill Bits)

Rock Drills (See Drills, Rock)

Rod Mills
Traylor Eng. & Mfg. Co.

Roller Bearings
S K F Industries, Inc.
Timken Roller Bearing Co.

Roofing (Ready to Lay)
Texas Company

Roofing and Siding (Steel)
Joseph T. Ryerson & Son, Inc.

Rope, Wire (See Wire Rope)

Rotary Screens (Sections and Segments)
Hendrick Mfg. Co.

Rubber Covered Screens
B. F. Goodrich Rubber Co.
Manhattan Rubber Mfg. Co.

Sand Drag
Smith Engineering Works

Sand Settling Tanks
Link-Belt Co.
Smith Engineering Works

Sand and Gravel Handling Machinery
Diamond Iron Works, Inc.

Scrapers (Power Drag)
Austin-Western Road Machy. Co.
Harnischfeger Corp.
Link-Belt Co.
Sauerman Bros.

Screens
Chicago Perforating Co.
Cross Engineering Co.
Diamond Iron Works, Inc.
Harrington & King Perf. Co.
Hendrick Mfg. Co.
Industrial Brownhoist Corp.
Link-Belt Co.
Lorain Steel Co.
Morrow Mfg. Co.
National Wire Cloth Co.
Nordberg Mfg. Co.
Productive Equipment Corp.
John A. Roebling's Sons Co.
Smith Engineering Works
Traylor Eng. & Mfg. Co.
Universal Vibrating Screen Co.

Screens (Perforated)
Hendrick Mfg. Co.

Screens, Scalping (Hercules and Standard)
Smith Engineering Works

Screens (Testing)
Hendrick Mfg. Co.

Screens (Vibrating)
Austin-Western Road Machy. Co.
Diamond Iron Works, Inc.
Link-Belt Co.
Nordberg Mfg. Co.
Productive Equipment Corp.
Smith Engineering Works
Universal Vibrating Screen Co.
Williams Patent Crusher & Pulv. Co.

Screens, Washing (Hercules, Ajax and Standard)
Smith Engineering Works

Screw Rewasher (Single and Twin)
Smith Engineering Works

Scrubbers
Diamond Iron Works, Inc.
Hardinge Company, Inc.
Lewistown Fdy. & Mach. Co.
Smith Engineering Works

Seal Rings
Traylor Eng. & Mfg. Co.

Separators (Slurry)
F. L. Smidth & Co.

Shovels, Power (Steam, Gas, Electric, Diesel, Oil)
Bucyrus-Erie Company
Harnischfeger Corp.
Industrial Brownhoist Corp.
Koehring Co., Division of National Equipt. Corp.
Link-Belt Company
Marion Steam Shovel Co.
Lima Locomotive Works, Inc. (Ohio Power Shovel Co.)

Silos
F. L. Smidth & Co.

Skip Hoists and Skips
Diamond Iron Works, Inc.
Link-Belt Co.

Slings (Wire Rope)
American Steel & Wire Co.
A. Leschen & Sons Rope Co.
John A. Roebling's Sons Co.
Williamsport Wire Rope Co.

Sockets (Wire Rope)
American Steel & Wire Co.

Speed Reducers
Link-Belt Co.
Traylor Eng. & Mfg. Co.

Sprockets and Chain
Chain Belt Co.
Diamond Iron Works, Inc.

Steel Bars
Timken Roller Bearing Co.

Steel (Bars, Shapes, Plates, etc.)
Joseph T. Ryerson & Son, Inc.

Steel (Electric Furnace)
Timken Roller Bearing Co.

Steel (Open Hearth)
Timken Roller Bearing Co.

Steel (Special Alloy)
Timken Roller Bearing Co.

Steel (Special Analysis)
Timken Roller Bearing Co.

Stokers
Babcock & Wilcox Co.
Combustion Engineering Corp.

Tanks
Combustion Engineering Corp.
Hendrick Mfg. Co.
Link-Belt Co.

Texrope Belts (for Texrope Drives)
B. F. Goodrich Rubber Co.

Tires (for Commercial and Passenger Cars)
B. F. Goodrich Rubber Co.
Manhattan Rubber Mfg. Co.

Tools (Pneumatic)
Ingersoll-Rand Co.

Track Equipment
Lorain Steel Co.
Nordberg Mfg. Co.

Track Shifters
Nordberg Mfg. Co.

Tractors
Kansas City Hay Press Co.
Koehring Co., Division of National Equipt. Corp.

Tramways (Aerial Wire Rope)
American Steel & Wire Co.
A. Leschen & Sons Rope Co.
Macwhyte Co.
John A. Roebling's Sons Co.
Williamsport Wire Rope Co.

Transmission Belting (See Belting)

Transmission Machinery
Diamond Iron Works, Inc.
Timken Roller Bearing Co.

Troughs
Cross Engineering Co.

Tube Mills (See Mills, Ball, Tube, etc.)

Tube Mill Liners (See Mill Liners)

Tubing (Blasting)
B. F. Goodrich Rubber Co.
Manhattan Rubber Mfg. Co.

Tubing (Seamless Steel)
Timken Roller Bearing Co.

Underground Shovels
Nordberg Mfg. Co.

Valves (Pump)
B. F. Goodrich Rubber Co.
Manhattan Rubber Mfg. Co.

Vibrating Screens (See Screens, Vibrating)

Wagon Drills
Ingersoll-Rand Co.

Washers (Sand, Gravel and Stone)
Austin-Western Road Machy. Co.
Eagle Iron Works
Hardinge Company, Inc.
Link-Belt Co.
Traylor Eng. & Mfg. Co.

Waste Heat Boilers
Combustion Engineering Corp.

Weigh-Mix
Koehring Co., Division of National Equipt. Corp.

Welding and Cutting Apparatus
General Electric Co.
Harnischfeger Corp.
McLean Welded Products Corp.

Welding Rod
American Steel & Wire Co.
McLean Welded Products Corp.
Joseph T. Ryerson & Son, Inc.

Welding Supplies
McLean Welded Products Corp.

Welding Wire
American Steel & Wire Co.
McLean Welded Products Corp.
John A. Roebling's Sons Co.

Wire (Rubber Insulated)
American Steel & Wire Co.

Wire Rope Sockets (See Sockets, Wire Rope)

Wire Cloth
National Wire Cloth Co.
John A. Roebling's Sons Co.

Wire Rope
American Steel & Wire Co.
Hazard Wire Rope Co.
A. Leschen & Sons Rope Co.
Macwhyte Co.
John A. Roebling's Sons Co.
Williamsport Wire Rope Co.

Wire Rope Fittings
American Steel & Wire Co.
Hazard Wire Rope Co.
A. Leschen & Sons Rope Co.
Macwhyte Co.
John A. Roebling's Sons Co.
Williamsport Wire Rope Co.

Wire Rope Slings (See Slings, Wire Rope)

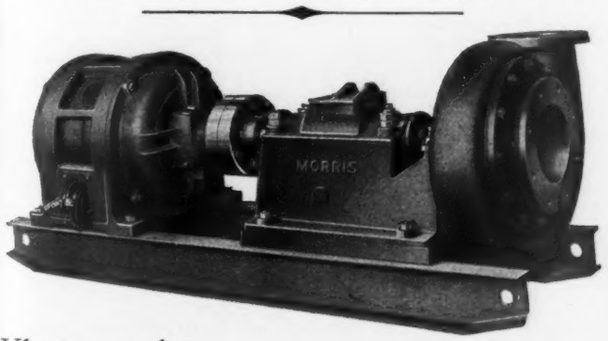
Wire (Welding)
McLean Welded Products Corp.

The MORRIS HYDRAULIC COLUMN

News of interest to Centrifugal Pump Users

Astronomical tonnages at microscopic costs . . . .

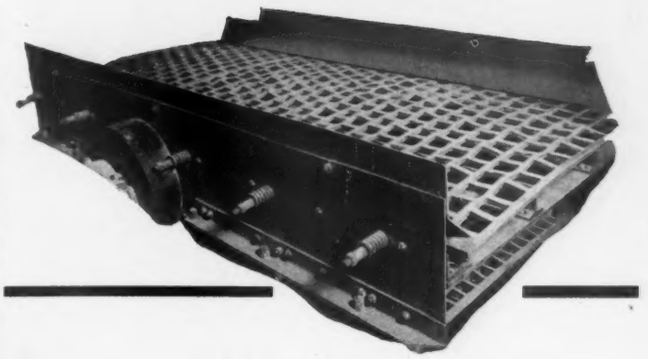
We once wrote to a number of customers to ask about performance records of their Morris Dredges. The result left us rather dizzy from the tremendous production figures and the tiny cost figures. Many of the dredges had each handled over a million cu. yds. of highly abrasive material without requiring any renewals. We learned of instances where sand and gravel were pumped, washed, sorted, and stocked in piles within 3 minutes after entering the dredge suction lines; where production was twice as high as expected; and where dredges had been used on upwards of four or more different jobs. Users told us of fuel costs less than ½ cent per ton of material handled, total production costs less than 10 cents per cu. yd., and renewal costs less than $10 per year over a long period. No wonder so many users of Morris Dredges refuse to consider any other make! Morris Dredge Bulletins contain many interesting performance references. A post card will bring you a copy by return mail.



What a sucker . . . .

An outstanding feature of this Morris Single Suction Pump is its ability to operate successfully on unusually high suction lifts. Even when this pump is 28 or 30 feet above the supply surface, it will hold its suction and deliver rated capacity continuously—of course, provided the water is cold. This unit could well be called our "omnibus" pump—it is adapted to so many purposes in mills, factories, process plants, for contracting work, etc. You will find it fully described in Bulletin 149—copy on request.

For authoritative recommendations on any pumping or dredging problem, write to Morris Machine Works, Baldwinsville, N. Y.



Your *Vibrating Screens Will Do More With*

HENDRICK DOUBLE CORRUGATED

For accuracy, efficiency, high capacity, and long life, use Hendrick Double Corrugated Vibrating Screen Plates. Made from High Carbon Steel or Abrasive Resisting Steel to meet your screening conditions.

For any of your other screening needs, use Hendrick. In flat plate, revolving screen sections or segments, buckets and troughs, you'll receive excellent workmanship and the characteristic prompt Hendrick service.

HENDRICK MFG. CO.

47 Dundaff Street **Carbondale, Pa.**

Baltimore Birmingham Boston
Cincinnati Cleveland Detroit Hazleton
New York Philadelphia Pittsburgh

Makers of Elevator Buckets of all types, Mitco Open Steel Flooring, Mitco Shur-Site Treads and Mitco Armorgrids. Light and Heavy Steel Plate Construction.

BEFORE YOU BUY ANY LOCOMOTIVE

Investigate these SHAY *advantages*

1. A powerful three-cylinder engine which starts heavy loads and hauls them wherever rails are laid.

2. A flexible driving shaft, and the fact that trucks are compensated for track inequalities assure dependable, free from derailment operation on uneven track.

3. A simplicity of construction, with all operating mechanism out in the open where it is readily accessible for lubrication, adjustment and repairs when needed.

Prospective locomotive purchasers should be thoroughly familiar with these Shay advantages. Write us for further details.

LIMA LOCOMOTIVE WORKS, Incorporated
Lima, Ohio
Sales Office: 60 E. 42nd St., New York, N. Y.

In the old sleigh ride days we thought jingle bells necessary to the pleasure of our trip—even though the noise may have made old dobbin nervous.

Some screens are still being equipped with jingle bells—annoying, troublesome, cost-boosting gadgets that look mysterious but mean little.

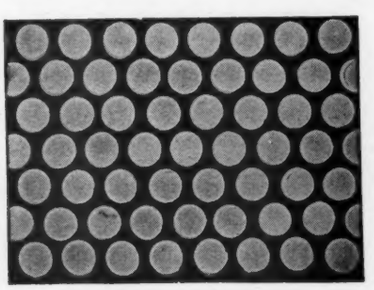
The Late Model UNIVERSAL Super-Vibrators are designed for large capacity at low cost and long trouble-proof service. No gadgets to wear, break or get out of adjustment. In other words — no jingle bells. You pay less at the start and much less in the end.

If interested—write for catalog.

NRA

UNIVERSAL VIBRATING SCREEN CO.
RACINE — — WISCONSIN

MORROW SCREEN PLATES

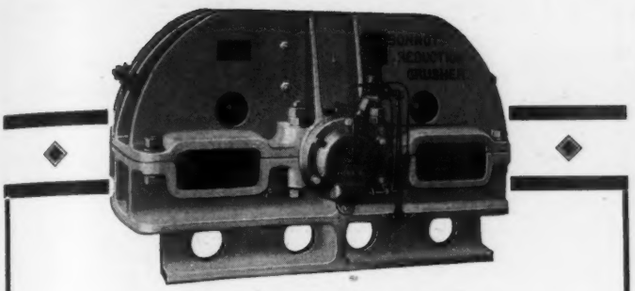


MORROW PERFORATED METAL SCREEN PLATES for sizing and preparing coal, sand, gravel, stone and other bulk materials are made by a Company specializing in screening machinery.

A complete set of punches and dies covering a wide range of sizes, in round, square, oval and diagonal slots are ready for the press, insuring prompt delivery of orders.

Prices are right.
Send for Bulletin 57.

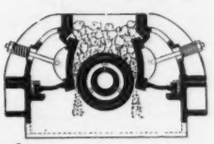
The Morrow Manufacturing Co.
Wellston, Ohio



BONNOT

REDUCTION CRUSHERS

Manganese Wearing Parts
Reversible Concaves
Cast Steel Frame



Bronze Sleeve Bearings
Renewable Liners
Extra Large Shaft
Positive Pressure Lubrication
Cast Iron Safety Plates

facts!

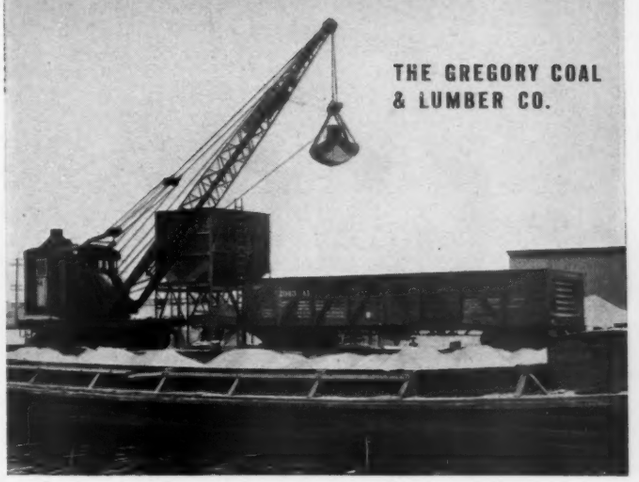
It is what the users say about the BONNOT Reduction Crusher that counts. Operators everywhere appreciate the advantages of the superior BONNOT design. Facts concerning actual power and lubrication savings, maintenance costs, ability to produce crushed aggregate to specifications, as obtained by users will be furnished upon request. Our leadership dates back to 1891. We share these years of experience with you in offering our recommendations. Your problem will receive our serious and sincere consideration without obligation.

Write us today.

THE BONNOT CO.
CANTON, OHIO

New York Office: 30 Church St.
Offices in Principal Cities

"Well Satisfied.. WITH OUR INVESTMENT IN THIS CRANE.."



The Gregory Coal & Lumber Company purchased an Industrial Brownhoist locomotive crane in 1920. Recently, during their annual equipment overhaul they tested and inspected this machine. What did they find? —"No repairs or parts needed," is their comment. Furthermore, they say—

"This piece of equipment has been continuously employed on our bulkhead dock in unloading bulk materials, brick, sand, etc., from water craft, as well as reloading these materials from storage piles to trucks, hoppers, etc.

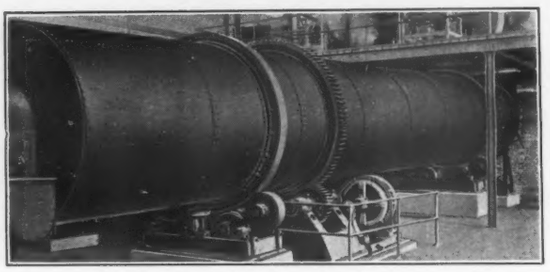
"Despite the fact that our Industrial Brownhoist has been exposed to salt marsh vapors and the ravages of weather, it is in splendid condition. We feel that this equipment was properly designed and constructed, and that its efficient operation has been due, in a large measure, to your practical suggestions in its operation and maintenance. We are well satisfied with our investment in this crane."

INDUSTRIAL BROWNHOIST CORPORATION
General Offices: Bay City, Michigan
District Offices: New York, Philadelphia, Chicago, Cleveland

INDUSTRIAL BROWNHOIST

THE COMPLETE LINE OF LOCOMOTIVE AND CRAWLER CRANES

"Ruggles-Coles" Dryers



There is only one solution to efficient dry grinding —to dry in a Ruggles-Coles dryer before grinding.

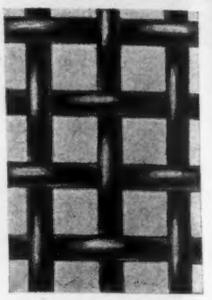
The savings will more than justify the drying cost—other advantages being, increased capacity and better control of product.

Tell us what you are doing. We will tell you how you can do better. Write for Bulletin No. 16B.

HARDINGE COMPANY
INCORPORATED
YORK, PA.—Main Office & Works Chicago—205 W. Wacker Drive
New York—122 E. 42nd St. San Francisco—444 Market St.

5 Star Features

- ★ Lasts five times as long as cloth made of ordinary steel.
- ★ Withstands vibration without crystallization.
- ★ Super-tough to resist abrasion.
- ★ Maintains accuracy throughout life of screen.
- ★ Has outworn other special alloy cloths.



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Nat-Aloy cloth developed from a special alloy steel. It possesses the maximum of resiliency and springs back into shape after the screening load is removed, thus preventing permanent sagging and preserving the shape of the screen indefinitely.

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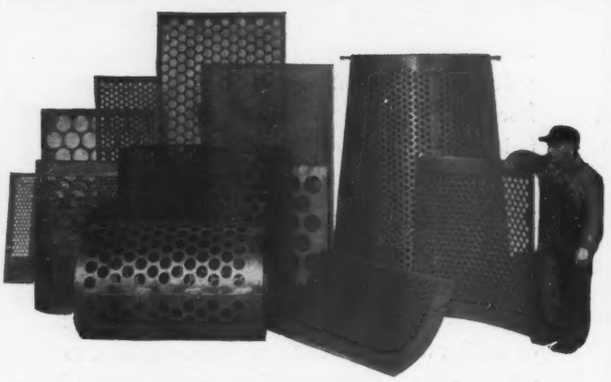

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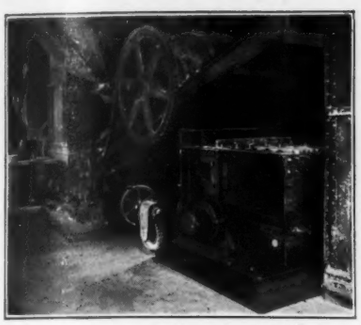
SINGLE ROLL CRUSHER and HAMMERMILL



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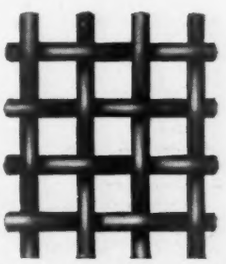

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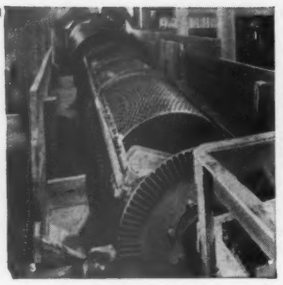

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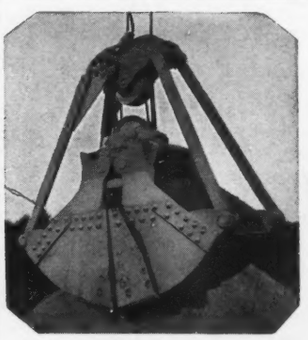

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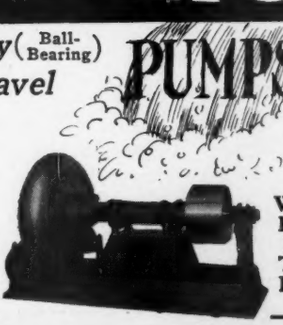

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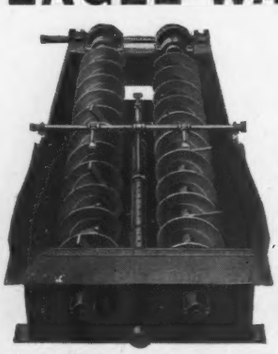

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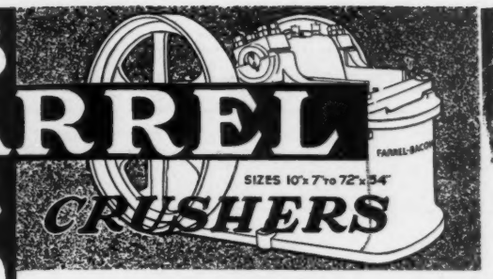

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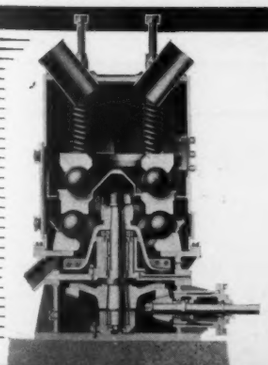

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